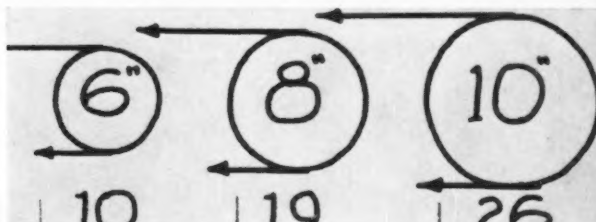

6"
8"
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10
19
26

R.P.M.
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B
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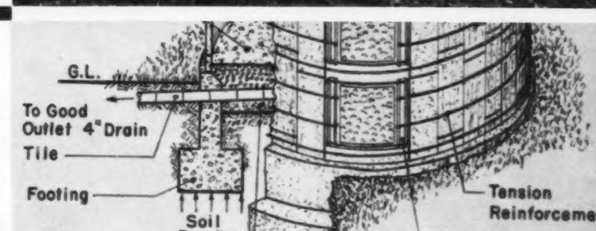
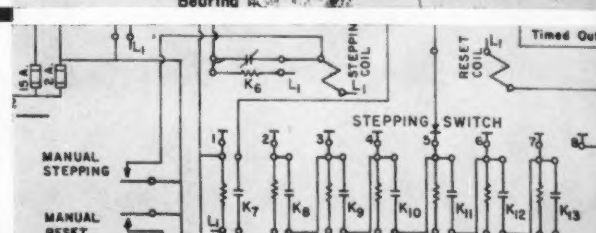


G.L.
To Good Outlet 4" Drain Tile
Footing
Soil Bearing
Tension Reinforcemen



STEPPING COIL
RESET COIL
Timed Out
STEPPING SWITCH
MANUAL STEPPING
MANUAL RESET

What synthetic sealing materials should I use—and when

Environmental conditions generally dictate the type of synthetic rubber for a specific oil sealing application.

Where temperature, shaft speed, runout, eccentricity, and lubricant type are "normal", standard Buna N synthetic rubber compounds are satisfactory. If, however, the application is "dry running", a compound must be selected that will operate satisfactorily with a very small amount of lubricant. If the application involves excessive abrasion, highly "loaded" compound stocks should be provided. At temperatures over 250° F polyacrylics or silicone compounds are indicated; if high temperature is accompanied by a solvent base or additive lubricant, polyacrylics are definitely preferred.

Thus many variables govern successful oil sealing. The chart below gives more data; for complete information from the world's foremost oil seal laboratories, call your National Seal engineer. He's in the Yellow Pages, under Oil Seals or O-Rings.

SYNTHETIC RUBBER COMPOUNDS | **RECOMMENDED APPLICATIONS**

Comp. No.	Base Polymer	Min/Max Operating Temperature	Life Index	Price Index	Automatic Transmissions	Pinions	Axle Seals	Engine Seals	Misc. Applications
B-63	Buna N	—40°F/225°F	100	100				Excellent for small gas engines.	Excellent for small non-spring loaded seals.
B-86	Buna N	—30°F/225°F	100	100		Satisfactory for medium temperature applications.	Truck and automotive rear axles. General use.	Satisfactory as general purpose material where temperature permits.	General purpose Buna N applications.
B-94	Buna N	—60°F/250°F	100	100					Excellent against aromatics and some military aircraft oils, fuels.
B-95	Buna N	—30°F/225°F	100	100					Good dry running compounds for applications requiring high durometer stock.
C-6	Buna N	—30°F/225°F	100	100			Excellent for semi-rough axles. Has good wear qualities.		Good for pressure seals due to high durometer and clean trimming.
L-28	Acrylon BA-12	—30°F/300°F	400	125	Good for temperature range indicated.	Satisfactory in single lip construction.	Sealed bearing high temperature applications.	Satisfactory for automotive use. High temperatures.	Satisfactory for high temperature general applications. Can be used with EP or GL-4 oils.
L-34	Hycar PA-21	0°F/300°F	400	115	Good for temperature range indicated.	Dual lip limited contact for high temperatures.	Sealed bearing high temperature applications.	Satisfactory for automotive use. High temperatures.	Satisfactory for high temperature general single or dual lips. Ok with EP or GL-4 oils.
S-48	Silicone*	—80°F/400°F	1500	150	Excellent high and low temperature life.	Silicone Compounds Not Recommended With EP Lubricants at high temperatures.		Excellent for general engine use. Suggested for premium gasoline and Diesel engines.	Excellent wide range material. Avoid use in EP and GL-4 oils.
S-49	Silicone*	—80°F/300°F	600	130	Good at high and low temperatures.			Very good for general engine use; premium gasoline and Diesel engines.	Very good wide range material. Avoid use in EP and GL-4 oils.

*Silicones require special stabilization for satisfactory use in aromatic oils at high temperatures.

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Problem: FLOTATION
Solution: Terra-Tires by Goodyear. An Indiana company put Terra-Tires on this scraper to prevent delays caused by equipment miring down. Result: Faster peat harvesting at lower cost.

Problem: NON-COMPACTION
Solution: Terra-Tires by Goodyear. A racetrack that's uneven can damage thoroughbreds' legs, so Santa Anita uses tractors with Terra-Tires to condition track after a rain without compacting ground.

Problem: CARGO PROTECTION
Solution: Terra-Tires by Goodyear. Bananas bruise easily, so United Fruit "floats" its fruit from farm to railhead on equipment fitted with Terra-Tires, which also permit all-season hauling.

If you're designing a "go-anywhere" vehicle – or one that must baby its cargo or the ground it goes on—Terra-Tires by Goodyear should be a part of your design. They're available in a wide range of sizes and treads. Let us know what you're driving at—or on—or over, we'll be glad to suggest a design to solve your problem. Write Goodyear, Aviation Products Division, Dept. G-1740 Akron 16, Ohio, or Los Angeles 54, California.

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Agricultural Engineering

Established 1920

CONTENTS · JULY 1961 · Vol. 42, No. 7

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JAMES BASSELMAN, *Editor and Publisher*

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Councilors Now Directors

THE name of the governing body of the Society was changed from the "Council" to the "Board of Directors" at the business meeting on June 27, held during the 54th Annual Meeting of ASAE in Ames, Iowa. The new constitutional change became official when L. W. Hurlbut, ASAE President, reported the results of a letter ballot submitted to the members of ASAE earlier in the year, and which closed at noon on June 7, twenty days preceding the business meeting. The final results of the balloting revealed 1708 approving the amendment and 32 opposing it. The change became effective immediately and the corresponding changes were made in the Society's By-Laws and Rules under the direction of the ASAE Board of Directors. Hereafter, this governing body will consist of eleven board members as follows: one president, one president-elect, one past-president, three vice-presidents and five "directors" (one director for each ASAE division).

Publication Committee

THROUGH the influence and encouragement of ASAE President L. W. Hurlbut, a new standing committee entitled "Publication Policies and Finances Committee" was authorized during the Winter Meeting at Memphis in December 1960. The purpose of the new committee is to act as an advisory group to the editor in determining editorial policy, procedure, and expansion for the Society's entire publication program. Membership on the committee ideally is to include members whose employment would be fairly representative of the Society as a whole and whose experience as a group would include familiarity with problems dealing with publications, advertising, public service agencies, industry, associations, and as many other Society interests as can be combined into a basic working committee. Each ASAE division is to be represented on the committee by one divisional technical advisor.

The organizational meeting of this committee was held June 7 in Chicago. M. L. Burgener, manager, farm bureau, Portland Cement Association, was elected chairman and K. W. Snyder, account supervisor, Aubrey, Finlay, Marley & Hodgson, Inc., was elected secretary. Other members of the committee are: H. H. Beaty, W. F. Buchele, S. S. DeForest, and R. R. Poynor.

AE Exposition Progress

MANUFACTURERS of products for the agricultural industry continue to show interest in the Agricultural Engineering Exposition to be held in conjunction with the ASAE Winter Meeting, December 12 to 15, at the Palmer House in Chicago. During the past month the number of exhibitors has grown to 28 and of most significance is the fact that two exhibitors have also expanded their original space requests.

William Fischer, marketing director, Shea Expositions Corp. (Exposition managers), attended the Annual Meeting of ASAE in Ames, Iowa, and announced that effort is being directed at broad diversification of products so that the Exposition will be of interest to the full ASAE membership. Currently, special attention is being devoted to manufacturers of chemicals (including plastics), structures, electrical equipment, and products for irrigation.

Reservations for exhibit booths may be made by writing to Shea Expositions Corp., One Gateway Center, Pittsburgh 22, Pa.

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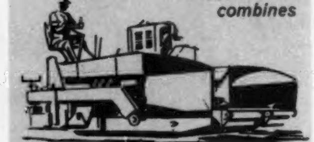

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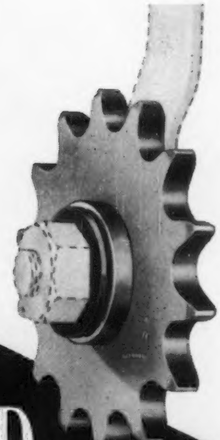

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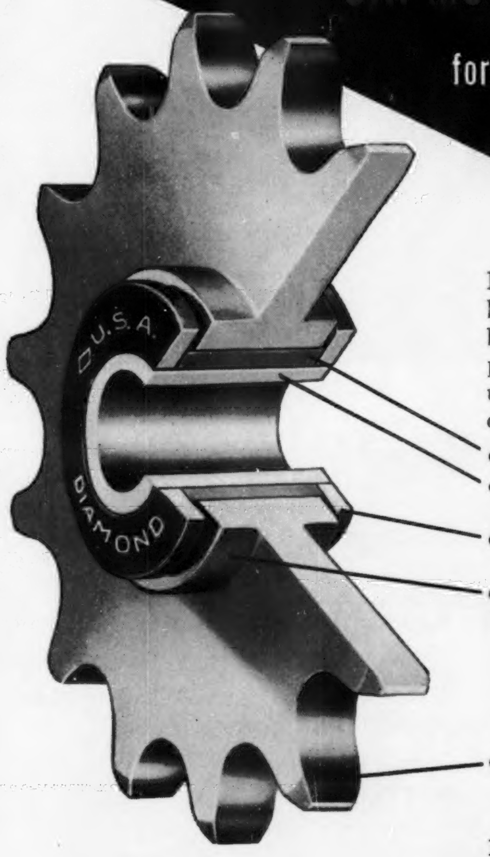

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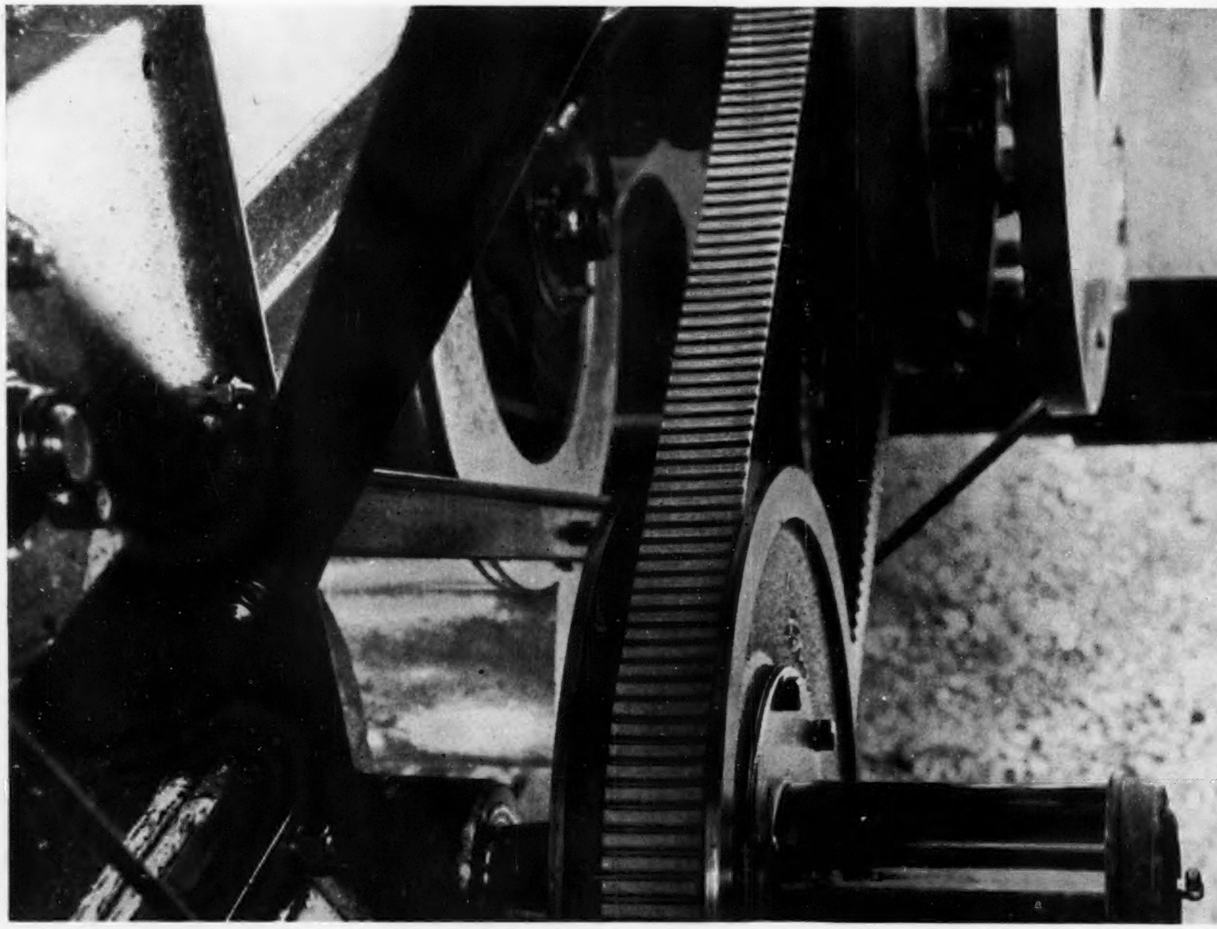


GLEANER
BALDWIN
ALLIS-CHALMERS

Report to Readers . . .

ANALOG COMPUTERS USEFUL IN TILLAGE EXPERIMENTS

USDA agricultural engineers at the National Tillage Machinery Laboratory have found that the analog computer saves time and improves accuracy in their tillage experiments. They list the following as principal advantages of this device: (a) less time is required of professional and subprofessional workers in converting readings from individual charts into mathematical formulas that formerly required up to 6 months; (b) since small, inevitable errors in converting the readings are eliminated, the data are more accurate, and (c) results of their experiments are more readily available to the engineers. Another thing, when some obvious error has been made or when changing one or more of the conditions of the experiment will give more useful information, the computer makes it possible to repeat an experiment at once.

MACHINE TO HARVEST GRASS SEED EXPERIMENTAL PLOTS

A USDA-Washington AES research team reports development of a tractor-mounted harvester for use in small plots that improves both the speed and the accuracy of their grass-seed production studies. The harvested grass can be bagged directly from a box on the harvester, and there is little loss of seed when cutting conditions are favorable. Sixty to seventy plots per hour, depending on the species of grass and extent of lodging, can be cut and bagged by a three-man crew. Mechanized harvesting of seed plots will also greatly reduce or eliminate losses that may be large enough to ruin the accuracy of production studies when the plots are harvested by hand.

AIRPLANE DISTRIBUTION OF PESTICIDE GRANULES

A USDA entomologist-agricultural engineer research team is developing two efficient ways of dispersing granular herbicides and insecticides, namely, from the wing and from a winglike attachment (airfoil) of an airplane. A specially equipped low-flying plane makes use of air currents from the wing or airfoil and from the propeller to distribute the pesticide granules. Swaths up to 45 feet wide can be easily treated, and with less variation in pesticide concentration in the swath than when granules are applied from a plane with conventional application equipment. . . . . Best results were obtained by releasing granules about 9 feet from the center of the plane. At this point, the granules were spread evenly in a swath 40 to 45 feet wide. . . . . The researchers are now developing equipment to convey granules for release through the wing and from a larger airfoil.

PRESERVATIVE SIMPLIFIES TREATING OF FENCE POSTS

An Illinois AES researcher reports promising results from initial tests of a simplified method of treating wood fence posts. For this purpose a pentagel preservative was used, which contained 10 percent pentachlorophenol in a petroleum solvent, together with special emulsifiers and water. The material was thickened sufficiently for application in heavy coatings of from ¼ to 1 inch. . . . . Application of the material is simple, since the gel can be readily spread with a mason's trowel from the bottom of the post to a distance of 6 inches above the ground line. On application to the wood, the material tends to form an outer crust. Beneath the layer of gel the water coating on the oil particles breaks down on contact with the wood, which permits the pentachlorophenol-oil solution to penetrate the wood. This penetration takes place after the post has been set in the ground, and it is complete when the gel is no longer visible. . . . . Initial test results are promising. Square Douglas fir post stubs with ¼ and ½-inch coatings of pentagel were all found to be sound after 4½ years in the ground. Over this same period 30 percent of the untreated control posts failed completely, 40 percent decayed, and only 30 percent remained sound.

(Continued on page 338)

 (Continued from page 336)

ENGINEERS ATTEMPT TO DRY GRAIN WITH INFRARED HEAT Michigan SU agricultural engineers are on the search for practical means of drying grain crops with infrared heat. . . . . The main advantage of infrared drying is that it is much faster than convection drying. For example, the time required to dry grain from 35 to 5 percent moisture content can be reduced from about 90 minutes with a hot-air system to about 20 minutes with an infrared energy system. . . . . The most common infrared heating source thus far has been the electric heat lamp. More recent experimental work, however, has shown that a gas flame is not only more efficient but also more effective for drying, provided a satisfactory system for adapting it can be worked out. . . . . In developing a system of drying with infrared energy, one of the problems presented is how to get the product to be dried in front of the heat source. It is essential that it not only be arranged in thin layers, but also that it be moved slowly enough for proper drying and yet fast enough to avoid damage to the product. . . . . The MSU researchers recognize that, with the mounting pressures for faster and more efficient crop handling, effort must now be directed toward performing this former field operation under more controlled conditions in the barn or other drying unit.

IRRIGATION EFFICIENCY STUDIED BY NEW METHOD A California AES irrigation engineer has reported that irrigation efficiency is under study from both the engineering and economic standpoints, to obtain more precise information on the use of water in agriculture. Methods determining the flow of water in furrow and border irrigation systems, recently developed by mathematical equations, have proved to be accurate and simple as a result of testing for several seasons under field conditions.
Use is being made of the equation method to prepare detailed information describing the characteristics and performance of any irrigation system as affected by soils, flow rate of water, field slope, and crop. Comparative economic situations can also be analyzed with such information, and the labor energy and capital available can become a part of the irrigation design.

CONCRETE FEED LOTS PAY OFF IN BEEF-FEEDING EXPERIMENT Results of an experiment last winter reported by Kansas SU researchers show that steers fed on a concrete-covered lot with shelter made significantly cheaper and better gains than those fed on a dirt lot without shelter. The steers in both lots were on an all-roughage ration. In one case the steers in the concrete lot gained 100 pounds $2.99 cheaper than those in the dirt lot, and in another test the gains were made at $3.58 a hundred cheaper. . . . . The cheaper gains were made in spite of the fact that the winter weather conditions were relatively mild with very little precipitation during the test period.

AIR CURTAIN MAKES EFFECTIVE DOOR FOR COLD-STORAGE ROOMS Michigan AES agricultural engineers have come up with a solution to the threefold problem resulting from frequent opening of conventional doors of cold-storage rooms, namely, refrigeration loss, greater load on compressors, and the difficulty of keeping a constant, uniform temperature inside the rooms. . . . . In tests they conducted, an air curtain was formed by directing a stream of air downward across an opening in a cold-storage room to an air-return grill in the floor. The air curtain was installed in a 7¼ square foot opening between two well-insulated chambers, one of which was maintained at 40 deg F and the other at about 85 deg. . . . . That the air curtain proved to be effective is indicated by the fact that losses through it were found to be only about one-tenth those through an unprotected opening. It was further learned that the amount of heat lost from the cold-storage room varied with the speed of the air and the height of the opening.


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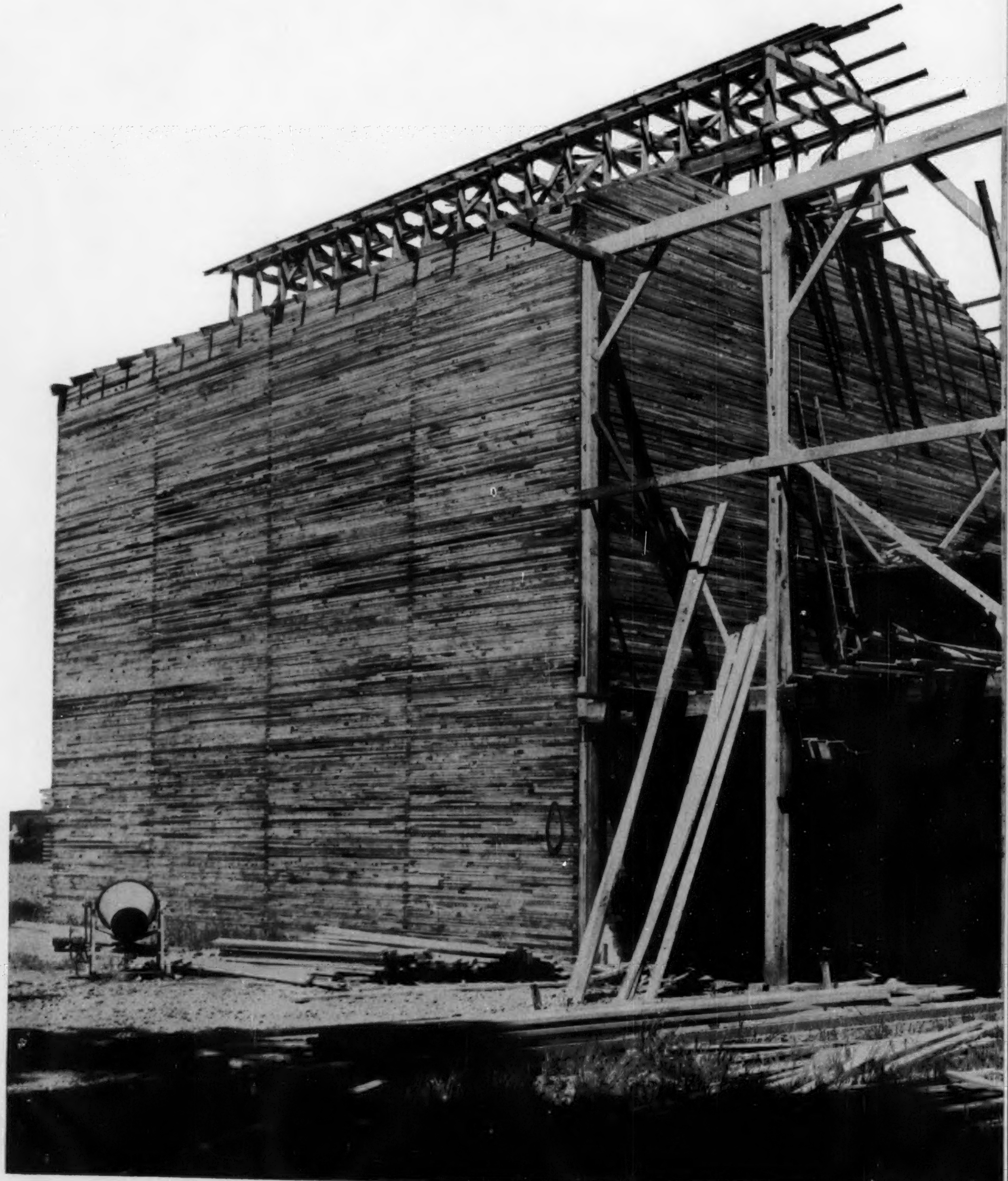

Another JOHN DEERE Implement Uses...

BLOOD BROTHERS
Jointed Drive Assemblies

A forage harvester that large-acreage growers will find ideal for their heavy-duty operations is the new John Deere "12." It combines versatility, big capacity, and dependability. Its six or seven-foot mower bar covers the acres with speedy precision. The basic machine is readily adapted for harvesting standing or windrowed hay crops and row crops.

This new unit, like many other most advanced farm implements, is equipped with a Blood Brothers drive line. Blood Brothers met the manufacturer's specifications exactly with an assembly from tractor P.T.O. to gear box. It is typical of the many drive assemblies Blood Brothers furnish for both specialized and conventional farm implements.

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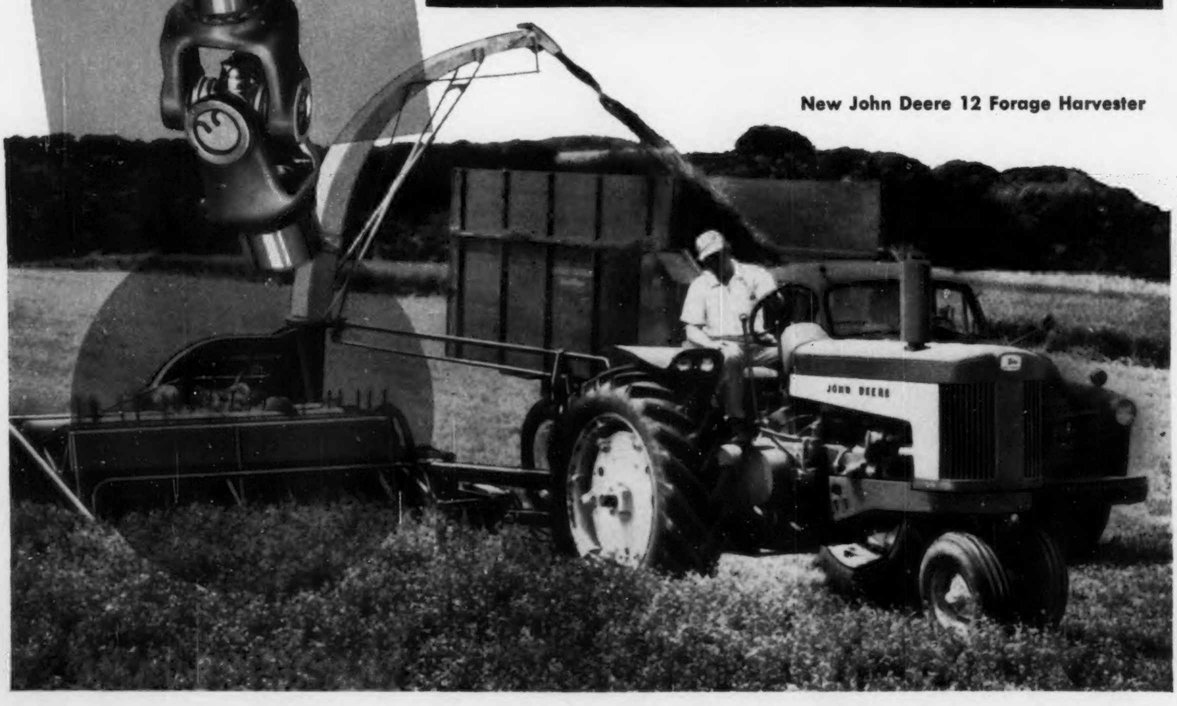

New John Deere 12 Forage Harvester

Agricultural Engineering

July 1961
Number 7
Volume 42

James Basselman, Editor

AGRICULTURE, ENGINEERING AND YOU

SCARCITY BARRIER SMASHED! ERA OF ABUNDANCE AHEAD! AGRICULTURAL ENGINEERS AND SCIENTISTS PROVIDE KNOW HOW! This could have been the top headline for this century — but, it failed to appear. These important facts were crowded out by a few glamorous events and some immediate problems of much less importance. But, it is never too late to tell the world about really big developments. So let's keep on with the job.

We must continually tell the people of the world that agricultural engineering is *vital* to agricuture and agriculture is a vital part of life today. These activities advance hand-in-hand with the standard of living and will continue to advance at an increasing pace, as long as mankind survives on this earth. These basic facts were recognized by the founders of our Society nearly sixty years ago. They are as basic today as they were then.

Living and working conditions in different countries show that where agricultural engineering is weak and manufacturing industries underdeveloped, most of the energy and income of the people is spent for food and fabric — the present living conditions for the largest part of the world's population. Here on this underdeveloped earth, agricultural engineering progress is an essential element in all countries regardless of their level of development. But, in a country like ours where a bountiful supply of food and fabric can be produced this fact often becomes overshadowed by developments in more glamorous areas. So, one of your jobs is to *keep selling your profession at its real value.* Agricultural engineers have played a leading role in creating the most dynamic agricultural industry in the world. Polish up your pride so that other people will notice it.

It is time for you to help both rural and urban workers understand the intricate interdependency between rural and urban businesses; and, the trend toward larger and more specialized business enterprises. And, it is time to help them realize that many new industries have come into being during the past fifty years to supply the needs of a more specialized type of farming. These include the manufacturing of farm machines, meat packing plants, dairy processing plants, food processors and canners, bakeries, feed processors, magazine publishers, and many others. Industries such as petroleum, rubber, chemicals, pharmaceuticals, advertising and many others are expanding rapidly so as to play an important part in the food and fiber segment of our economy.

L. W. Hurlbut

President, ASAE, 1960-61, and chairman, agricultural engineering dept., University of Nebraska

Today's agriculture, appraised in terms of its broadest dimensions, comprises more than one-third of the national economy. But, remember this — the largest part of this massive food and fiber complex now functions off-the-farm. So, it is difficult to get a good perspective of the massive over-all dimensions and the complex composition of this industry.

The agricultural industry is a giant with three arms. The arms outstretch to: farm production — farm supplies and service — and, food and fiber processing and marketing. It is most important that you understand the growth characteristics, the functions and the engineering needs of each of these arms.

The farm production arm reaches out to manipulate man-made environment for the efficient production of crops and livestock. The biggest farm tasks today are — the mechanics of crop culture — the mechanics of harvesting, conditioning and handling the plant materials produced — and, the mechanics involved in transforming plant materials into animal products and disposing of the waste. There is an increasing amount of agricultural engineering represented in modern farm production operations.

The farm supplies and services arm encircles all activities related to manufacture and distribution of farm production equipment, feeds, fertilizers, buildings, equipment, electricity, and other supplies and services. Historically, the manufacture and distribution of farm machinery has provided the majority of employment opportunities for agricultural engineers.

The food and fiber processing and marketing arm reaches out to include a wide range of businesses, products, and special services. Included are such things as commercial feeds, dairy products, milling, bakery products, locker plants, supermarkets and many others. This area now commands from sixty to eighty cents out of the food dollar and it is growing rapidly.

All three arms of the modern agricultural giant require agricultural engineering principles and practices in order to prosper. And, they emphasize the need for greater versatility in agricultural engineering education. The kind of versatility that depends upon greater breadth and depth of knowledge in: engineering science — biological and earth science—humanistic social science — coupled with the ability to design creatively units of synthesized systems.

The ability to design and synthesize must be developed in agricultural engineering courses. So, there is real need to take a "new look" at all of these courses. They should emphasize the application of physical and biological sciences and high speed computers in arriving at alternate solutions to carefully selected problems.

The need for versatility is well illustrated in five dynamic areas that hold a wide variety of challenges for agricultural engineers. By 1975, the agricultural labor force must be equipped to produce 35 to 40 percent more food and fiber to meet the needs of the growing population. And the population is expected to grow at a high rate after 1975. This means that one "space-age" problem ahead is less space per person for the production of food and fiber. There are fewer than eleven acres per person in the United States and this is expected to be less than six acres in forty years. More than seventy percent of today's agricultural engineers expect to live that long so most of you will deal with this problem. Production controls in the year 2000 may shift from crops to people!

You can help to step-up the output per man-hour of labor in the production of meat animals. If meat animal production is to keep up with the rest of the economy, the output per man-hour must be increased from the current rate of one percent compounded annually to about 4.8 percent. This means that, by 1975, farmers may be spending more for materials handling equipment, exclusive of structures, than for trac-

(Continued on page 370)

Annual address of the President of the American Society of Agricultural Engineers before the 54th Annual Meeting of the Society at Iowa State University, Ames, June 25-28, 1961.

V-Belt Design for Farm Machinery

Method of checking V-belt drive design for agricultural machinery

James Adams, Jr.

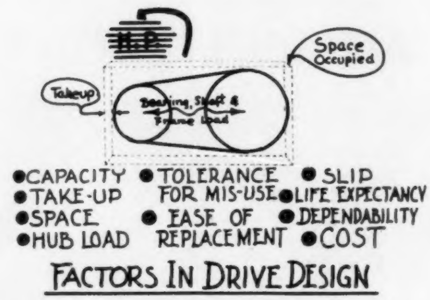

Figure 1

THE agricultural machine designer has been among the first to make widespread use of V-belt drives as a component part of machines. In fact, he has been a pioneer in the design of compact V-belt drives, occasionally to the apprehension of the V-belt supplier, because of uncertainty about loads and service expectancy. The vehicular and portable nature of much agricultural machinery continuously calls for economy of space and weight of parts, especially as the power, capacity, and efficiency of these machines is increasing. When a new model is on the drawing board and its V-belt drives are laid out, the question is, will they perform satisfactorily? Will an existing drive that has been satisfactory still be satisfactory with the larger engine? What is the effect of reducing or increasing sheave diameters or center distance?

Different Drive Designs, Different Results

A V-belt drive will operate well over a wide variety of horsepower ratings, sheave speeds and diameters, and belt speeds. This tremendous versatility may give the design novice the illusion that, since they all work, any one V-belt-drive design will give about the same results as any other. However, experience shows, for example, that if an HC cross-section V-belt will transmit 6 hp from a 10-in. diameter sheave at 540 rpm to a 7-in. diameter sheave for x number of hours on test, an increase in the load from 6 to 7 hp will reduce the average flex-life expectancy to $\frac{1}{2}x$ hours. If, on the other hand, the sheave diameters are decreased 25 percent to save space or cost, the drive will still work but the average flex-life expectancy of the belt will be reduced to one-tenth of x hours. Also, the belt tension loads on sheaves, shafts, bearings, and brackets, and the frame will be increased by 25 percent.

It is the purpose of this paper to describe a V-belt drive analysis method, adopted by the V-belt industry, which will enable the designer to predict some performance characteristics of a V-belt drive while it is still on the drawing board. The basic principles described apply to all belt drives, but the tables, factors, and numerical results shown apply to standard agricultural V-belt cross sections HA, HB, HC, HD, and HE and double angle belts of the same cross sections of a quality level described by the RMA 1960 standard multiple V-belt horsepower tables.

A V-belt drive design as a whole is an assembly of belt, sheaves, shafts, bearings, and frame. Like the ingredients of an apple pie, each may be of the best quality yet give unsatisfactory results when put together in the wrong proportions. A satisfactory drive (Fig. 1) is one which is expected to meet the machine requirements with regard to:

- Horsepower capacity
- Amount, frequency, and ease of takeup adjustment
- Space occupied
- Bearing, shaft, frame, and bracket loads
- Tolerance for probable abuse, interference, and misalignment
- Ease of replacement
- Permissible slip
- Life expectancy
- Dependability
- Cost

The question then is: what combination of belt section, center distance, sheave diameters and speeds, shaft and bearing sizes, frame rigidity, and horsepower load will produce the desired results most economically? The answer to this question and the behavior of V-belts are approached through a determination of the relative flex-life expectancy of a belt on a drive design.

The life load relation of V-belts has become well known through studies of many laboratory and field tests.

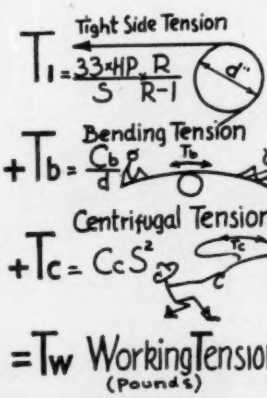

Figure 2

Paper sponsored by the Rubber Manufacturers Assn. and presented at the Winter Meeting of the American Society of Agricultural Engineers at Memphis, Tenn., December 1960, on a program arranged by the Power and Machinery Division.

The author — JAMES ADAMS, JR. — is chief engineer, research and product design, Raybestos-Manhattan, Inc., Passaic, N. J., and member, V-Belt Technical Committee, Rubber Manufacturers Assn.

Except for premature failure due to accident, abuse, misapplication, or inadequate maintenance, a V-belt has a predictable flex-life expectancy which is the time it takes before it breaks apart from the fatigue of bending and unbending around sheaves and pulleys under tension. It acts as if, each time it bends, a small part of its life is drained away. The assembly of belt, sheaves and pulleys acts to confirm that the flex-fatigue effect of each sheave and pulley, when added arithmetically, gives the flex fatigue effect of one complete cycle of the belt around the sheaves and pulleys. Therefore, the procedure is to determine first the flex fatigue effect at each sheave and pulley (Fig. 2).

The flex fatigue effect at a sheave or pulley is related to the total working stress or tension that develops in the belt as the sum of three tensions:

T_1=the *tight side tension,* or the maximum tension in the belt before it enters or after it leaves the sheave or pulley. It is calculated as follows:

$$T_1 = \text{horsepower} \times 33/S \times R/R-1 \text{ (pounds)}$$

in which S is belt speed in feet per minute divided by 1,000 and R is the recommended maximum ratio of tensions in the belt before entering and after leaving the sheave or pulley, exclusive of centrifugal tension for the arc of belt contact available*.

T_b=the *bending tension* calculated by dividing a bending constant, C_b* by the pitch diameter, d, of the sheave or pulley:

$$T_b = C_b/d \text{ (pounds)}$$

T_c—the *centrifugal tension* that occurs in the belt as a consequence of centrifugal force tending to throw the belt away from the sheave or pulley. This is calculated by multiplying a centrifugal constant, C_c* by the square of S:

$$T_c = C_c S^2 \text{ (pounds)}$$

The *working tension* (T_w) at each sheave or pulley is the sum of the three tensions:

$$T_w = T_1 + T_b + T_c \text{ (pounds)}$$

Following this procedure, if we examine an HC cross-section V-belt transmitting 10 hp at 3300 fpm on a 6-in. pitch diameter sheave with 180 deg arc of contact, and the tension ratio *(R)* recommendation is 5, the working tension in the belt will be as follows:

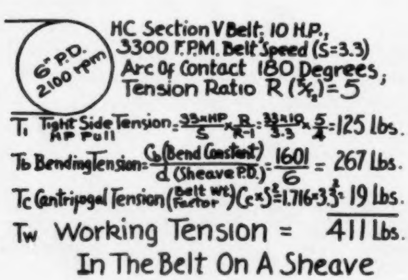

Figure 3

Designers' Choice

Of course, there are other combinations of tensions that add up to 411 lb working tension. But this is more than a mere choice of numbers. There are some important differences in the drive performance. To illustrate, following are three combinations that result in the same T_w working tension but with different diameters and horsepower loads at the same speed:

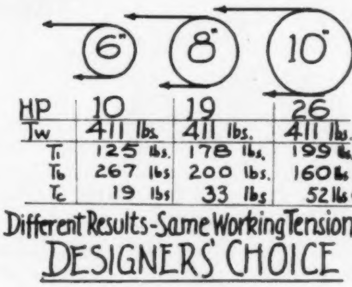

Figure 4

The equal working tensions (411 lb) shown above may not give equal life expectancy due to the flex-frequency effect of changes of belt speed and length with change in diameter. This effect, therefore, may alter the horsepower differences above as described later.

$$\text{Flex Fatigue Effect} = \left(\frac{T_w}{\text{Belt Design \& Quality Factor } X}\right)^{11.1}$$

or

$$\binom{\text{Flex Fatigue}}{\text{Modulus}}\ FFM = \left(\frac{T_w}{X}\right)^{11.1}$$

(see tables)

THE LIFE-LOAD RELATION FOR STANDARD V-BELTS

HA(AA), HB(BB), HC(CC), HD(DD), HE

Figure 5

The Life-Load Relation

The working tension (T_w) is found to have a relation to the flex-life expectancy of the belt. The flex fatigue effect (Fig. 5) is represented by a power function of the ratio of the working tension (T_w) to a belt design and quality factor (X). This relation is $(T_w/X)^{11.1}$ for the V-belts described in this paper. Because this relation expresses an inherent characteristic of the belts, it is called the *flex fatigue modulus,* or ffm, and is tabulated for convenience in the appended tables*. The belt design and quality factor (X) for the HC cross-section V-belt in the previous example is 231. Therefore, the flex fatigue modulus for the combinations described that resulted in a working tension of 411 lb is $(411/231)^{11.1}=600$.

Fatigue Effect of the Drive as a Whole

Fig. 6 shows a complete drive in which the situation of the 6-in. diameter sheave of the last illustration is the small sheave. To complete the drive, we have an 18-in. diameter large sheave and an 8-in. diameter reverse bend idler on the slack side. The working tension (411 lb) and fatigue effect (ffm=600) at the 6-in. drive sheave has already

*Tables referred to are furnished with ASAE Paper No. 60-634. (See footnote, page 353.)

(Continued on page 353)

Feed Grinding Studies

Basic observations and challenges on grinding procedure

S. M. Henderson
Member ASAE

EXPLORATORY basic studies of feed grinding by the author have indicated that the size-reduction theory of mining and chemical engineering also applies to the grinding of grains for animal feed. The studies pointed out a possible fallacy in the size-classifying procedure used for ground feed, and emphasized a need for additional investigation of the grinding process that could lead to a new type of grinding procedure. The study reported in this paper is only one of a number of similar studies, all yielding comparable results.

A rather extensive literature review was made to determine if grinding procedures other than those now in use were described. If so, it was thought they might serve as a point of departure in developing improved size-reducing procedures. No fundamentally different processes were found (2, 3, 11)*.

Barley of 10.1 percent moisture content was ground in a small hammer mill under recommended operating conditions. The fan for removing the ground feed was replaced by an externally powered pneumatic system so that the power input to the grinder would be used only for grinding. Duplicate runs were made with grinding screens furnished with the mill (holes of ⅛, ¼, ⅜, and ¾ in.). The feed rate was adjusted by the mill hopper gate to provide a motor amperage indicating a mill shaft input of 1.1 hp for each run.

The capacity, power used, and fineness modulus of the material are shown in Table 2, an average sieve analysis in Fig. 1. The sieve analysis was made according to fineness modulus standards of the ASAE (1) — 250 grams agitated for 5 min in a ro-tap machine, using the sieves listed in Table 1.

TABLE 1. SIEVES USED FOR FINENESS ANALYSIS

Mesh openings per inch	Size of openings, in.	Average size of material retained, in.	Multiplier F
4	0.185	0.262	6
8	0.093	0.131	5
14	0.046	0.065	4
28	0.0232	0.0328	3
48	0.0116	0.0164	2
100	0.0058	0.0082	1
Pan	———	0.0058	0

The openings in each sieve are square, with clear side dimensions as shown. Thus material retained on a specific sieve had a shape and dimensions such that it would pass through a square opening of the dimension of the previous sieve, but would not pass through the opening of the sieve upon which it was retained. Since the sieve openings are established on a geometric ratio (of two), the average

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The author — S. M. HENDERSON — is professor of agricultural engineering, University of California, Davis.

*Numbers in parentheses refer to the appended references.

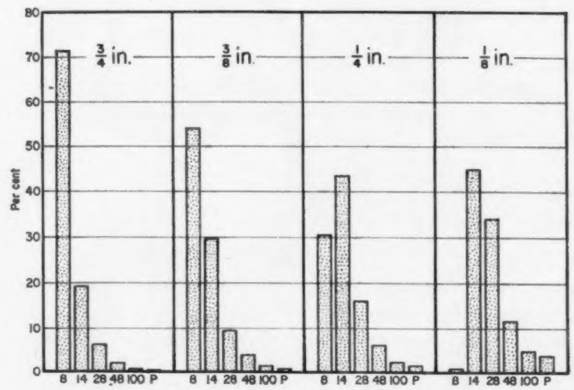

Fig. 1 Average sieve analysis of barley ground through the four different grinding screens indicated at the top of the figure. The abscissa numbers are sieve openings per inch (Table 1)

dimension of material retained on a sieve is the geometric average of the sieve opening and the opening of the sieve immediately preceding. For example, the material retained on the 28-mesh sieve ranges in size, as defined above, from 0.0232 to 0.046 in. The average size, or representative dimension, is assumed to be $\sqrt{0.0232 \times 0.046}$, or 0.0328 in. The average size, or dimension, specified as *D*, of the material retained on a specific sieve, is indicated by the following equation:

$$D = 0.0041(2)^F \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad [1]$$

The appropriate exponent *(F)* is noted in Table 1.

The fineness modulus, FM, is the sum of the products of the weight of material retained on each sieve multiplied by the respective *F*, Table 1, divided by the sum of the weights. The fineness modulus can be shown to be the logarithm of an average dimension of the ground material, the average dimension being a geometric mean of the average size on each sieve weighted on the basis of amounts. Thus equation [1] can be used for computing the average particle size of the ground material by replacing *F* by *FM*. The average particle size in Table 2 was computed from the experimental runs in that manner.

TABLE 2. CAPACITY AND FINENESS OF GROUND GRAIN

Run No.	Hammer mill screen size, in.	Grinding rate, lb per hr	Energy relationship: lb per hp-hr	Energy relationship: hp-hr per ton	Fineness modulus, *FM*	Average particle size, in.
1	¾	672	611	3.28	4.59	0.0990
2	¾	654	595	3.36	4.56	0.0968
3	⅜	472	429	4.66	4.23	0.0767
4	⅜	472	429	4.64	4.31	0.0808
5	¼	312	284	7.04	3.85	0.0590
6	¼	282	430	7.82	3.93	0.0628
7	⅛	108	98	20.40	3.14	0.0360
8	⅛	111	101	19.80	3.13	0.0360
		Whole grain			4.98	0.130

Theoretical energy-size relationships for grinding were proposed by Rittinger (12) in 1867 and Kick (7) in 1885. Rittinger postulated that the reducing process was essentially one of shearing that exposed new surfaces. Consequently, the required energy is

$$E = C \int dD/D^2 \qquad [2]$$

or $$E = C\,(1/D_2 - 1/D_1) \qquad [3]$$

in which C is a function of the material to be reduced, that is, ground. E is the energy required per unit of mass.

Kick theorized that size reduction was a process of crushing by exceeding the elastic limit, and consequently that energy was related to a single significant dimension of a material:

$$E = C \int dD/D \qquad [4]$$

or $$E = C \ln (D_1/D_2) \qquad [5]$$

Experience in the mineral and chemical industries has demonstrated a wider applicability of Rittinger's concept, although few materials fit either theory specifically.

By generalizing equations [2] and [4] to

$$E = C \int dD/D^n \qquad [6]$$

which integrates to

$$E = k\,(D_2^{1-n} - D_1^{1-n}) \qquad [7]$$

we have a relationship that can be used to characterize the energy requirement for any material.

The eight sets of observed data in Table 2 were available to provide values for k and n in equation [7]. Unfortunately, and probably contrary to the first thoughts of the reader, the function does not permit analytical determination of the constants. The data, when processed by an iterative statistical procedure, showed that n must equal 1.75 and k equal 2.46 for equation [7] to best represent the observed data. The relationship is shown in Fig. 2. The standard deviation is 1.2 hp-hr per ton. Difficulty in maintaining a constant feed rate during each test is believed responsible in the main for the deviation from the curve, although, as shown later in this paper, the sizing procedure may also be a contributor.

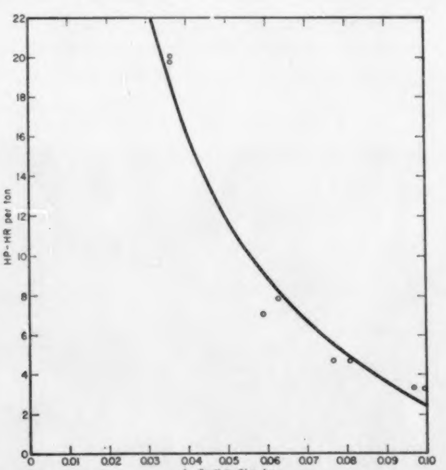

Fig. 2 Power required for grinding a sample of barley from an average size of 0.130 in. to the average particle sizes shown. The points are observed. The curve is a representation of equation [7], with k being 2.46 and n 1.75

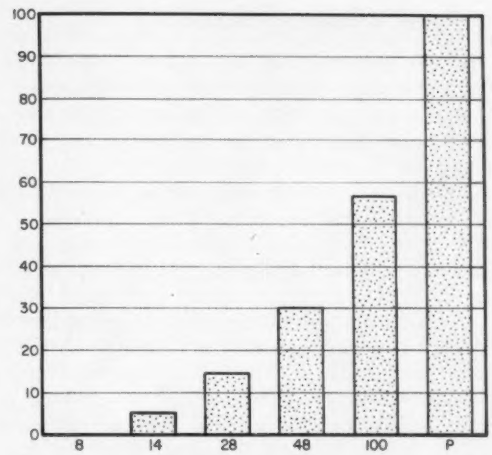

Fig. 3 Relative power required to grind equal amounts of barley from 0.130 in. to the mesh size shown. (See Table 1)

The power required for grinding to various finenesses can be computed by equation [7], using the derived constants and a D_1 of 0.130 (average size of materials in Table 1). Relative power for equal quantities of material ground to a specific size are shown in Fig. 3. For example, grinding a bushel of barley from an average of 0.13 to 0.0164 in. (48 mesh) requires twice the power needed to grind to 0.0328 in. (28 mesh). The power for the sieve fractions produced by grinding with the one-fourth-inch screen (the one most frequently used in feed grinding) is presented in Fig. 4. (Note, for example, that only 3.6 percent of the material passed through the 48-mesh sieve, but that the power required for this small quantity was 30.4 percent of the total.)

Investigators of animal nutrition generally agree that ground feed is more effective than unground feed. They also generally agree that extra-fine material is undesirable. There is no firm agreement, however, on the definition of "extra fine" material or its quantitative effect on feeding value for any specific animal. Thus, since extra-fine mate-

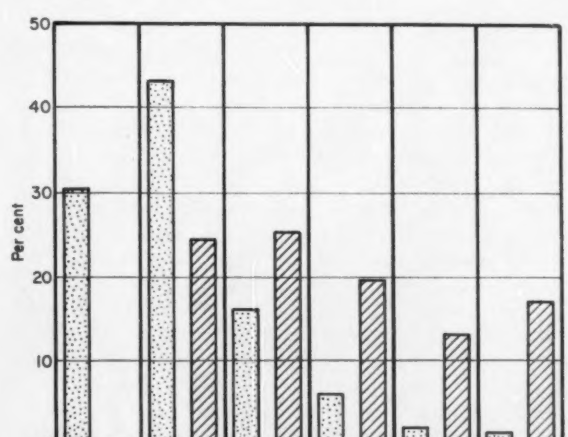

Fig. 4 Average sieve analysis (stippled) and power required (cross-hatched) for various size fractions of barley ground by the ¼-in. screen

rial has poor feeding value and requires excessive power for its formation, the *first engineering challenge* is evident:

Design a feed mill that will produce a more uniform product. Some suggestions for consideration are as follows (Fig. 5):

1 Use the closed circuit system of grinding (A). The grinder is adjusted or designed for coarse grinding. The product leaving the grinder is sorted mechanically or pneumatically, and the oversize particles are returned to the grinder for additional reducing. Or the grinder may be fitted with air movement designed to remove particles that have been reduced to a specific size or smaller. A hammer mill with screen having large holes, or perhaps with no screen, might be adapted for this type of grinding, or a new type of mill might be designed. This procedure, used extensively in the chemical industries, would produce a more uniform material with less power per ton.

2 Provide a mill with uniform kinetic energy application (C). Kinetic energy varies as the square of the velocity of the source of the energy. Thus a particle of grain hit by the hammermill hammer at a point halfway between the axle and hammer end receives only one-fourth as much energy as if hit by the end of the hammer. The amount of reduction (grinding) must surely vary with this variable application of energy. If the rotating hammer system were replaced by a drum of large diameter fitted with lugs of short height, each grain would be subjected to nearly the same quantity of kinetic energy when hit by a hammer, and the product should be more uniform. A rotor of this type would not eliminate the reduction that must take place when a high-speed particle impinges on the screen or the housing of the mill, or is deflected back to the rotor. Perhaps a rotor of this type in a closed-circuit system would provide a superior product.

3 Use two serrated rolls, slightly separated and turning in opposite directions at high speed, one faster than the other (B). If the mill is not overfed, each particle should receive the same treatment in passing through, improving the uniformity of ground product. A mill of this type would be similar to a roller mill, but would perform somewhat as a burr (attrition) mill because of the relative movement of the rolls.

4 Feed the grain into a centrifugal fan-type rotor (D). Permit the high-speed grain leaving the rotor to impinge on a breaker bar for reducing. Such a device could provide high particle velocities for reducing, and the particles could be removed before secondary reduction resulted. At least one mill of this type is now available.

The *second engineering challenge* involves some features of the analytical procedure discussed in this paper. The sieves used for fineness analysis contain square openings. Thus a particle can pass through the sieve if two of its three dimensions are equal to or smaller than the side of the opening; length, if greater than the other two dimensions, does not affect passing. The sieve procedure is appropriate if the various fractions are geometrically similar. If, however, the particle geometry (shape) changes with size, the computations become questionable.

Note that nearly all of the whole grain used in the test was retained on the 8-mesh sieve (Table 2). But 30½ percent of the ground material from runs 5 and 6 (Table 2 and Fig. 1) was retained by that sieve. Analytical procedure can only assume that this material is whole grain, and therefore must assume that it represents no significant energy of reduction. Fig. 6 is a representative sample of grain retained on the 8-mesh sieve from the sieve analysis of the material ground by the ¼-in. screen. A study of the illustration shows the fallacy of both these assumptions. Many of the particles are reduced particles that are not so indicated in the size analysis since they could not pass through the sieve, or for which the energy used is not in-

(Continued on page 364)

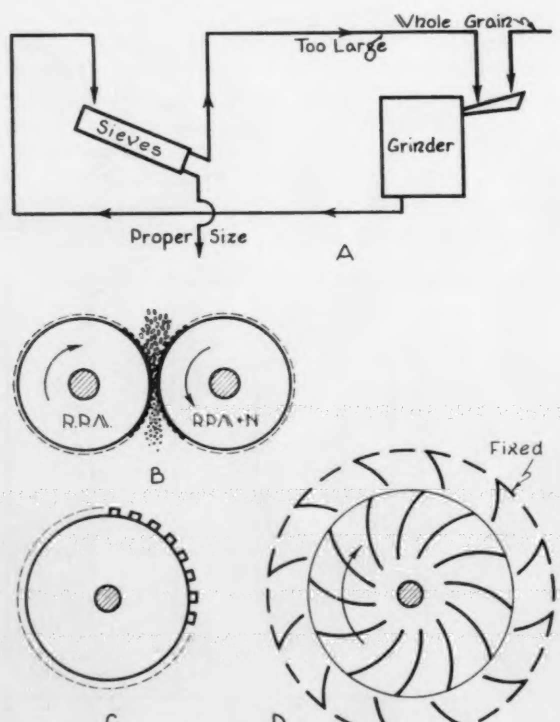

Fig. 5 Suggested procedures or devices for improving the uniformity of the ground product

Fig. 6 Material retained on the 8-mesh sieve from a sieve analysis

. . . V-Belt Design

(Continued from page 349)

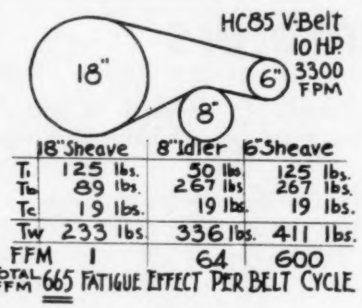

Figure 6

been found. In the same way, the working tension and flex fatigue modulus is found for the 18-in. drive sheave and the 8-in. reverse bend idler. For the reverse bend idler the tight side tension *(T_1)* is taken as a third of the sum of the tight and slack side tension or ⅓ (125+25)=50 lb, and the reverse bending tension *(T_b)* is figured as one-third more than a right-side-up bend, or four-thirds of 1601/8= 267 lb. The belt speed is the same on all sheaves. Therefore, the centrifugal tension is the same on all sheaves—19 lb. The whole drive then tabulates as follows:

	18-in. sheave	8-in. idler	6-in. sheave
T_1	125 lb	50 lb	125 lb
T_b	89 lb	267 lb	267 lb
T_c	19 lb	19 lb	19 lb
T_w	233 lb	336 lb	411 lb
ffm	1	64	600

The total ffm, or flex-fatigue effect, per cycle of the belt around the sheaves and pulley is 1+64+600=665.

Fatigue Rate (Drive Severity Number) of the Drive

The total fatigue effect (ffm) per cycle, when multiplied by its frequency of occurrence ratio, gives a number indicating the rate at which the flexlife of the belt is drained away, or the severity of the drive. The frequency of occurrence is indicated here by the ratio of the thousands of feet per minute belt speed *(S)* divided by the inches of belt length *(L)* or the ratio S/L. In the example, the belt speed is 3300 ft per minute and the belt length is 85 in., making the S/L ratio 3.3/85=0.039. Therefore,

V-belt drives for industry designed with the use of RMA Multiple V-Belt Horsepower Tables and Factors

$$\begin{array}{c}\text{FATIGUE RATE}\\ \text{OF THE DRIVE}\\ \text{or}\\ \text{DRIVE SEVERITY}\\ \text{NUMBER}\end{array} = \begin{array}{c}\text{FATIGUE EFFECT}\\ \text{PER BELT CYCLE}\\ \text{or}\\ \text{TOTAL FLEX}\\ \text{FATIGUE MODULUS}\end{array} \times \frac{S}{L}$$

$$\text{DS No.} = 665 \times .039$$
$$= \underline{26}$$

FLEX FATIGUE RATE OF THE DRIVE

Figure 7

(1955 edition-premium ratings), when analysed by this method will show a drive severity (DS) number of approximately 2. A drive designed to last one-half as long will show a DS number of approximately 4, etc. Drives for machinery and equipment intended for seasonal or intermittent use, or where portability calls for the most compact drives, as in many agricultural machines, V-belt drives may be properly designed to somewhat higher DS numbers. Where a drive is contemplated to be in the neighborhood of DS number 30 or more, generated heat in the belt may alter the physical characteristics of the belt enough to change the lifeload relation and render the results of this calculation questionable. Experience shows that, when chronically short-lived drives are analysed by this method, they are usually found to have a high DS number. This method will lead to a choice of design change that can bring the DS number down to an acceptable level. The chief practical value of the DS number is to serve as a reliable ratio or comparison of the life expectancies of one drive design with another. DS number comparisons are useful to show the probable effects of speculative design changes and what kind of a design change would be most helpful. Much exploratory testing can thus be avoided and design targets reached more quickly.

Flex-Life Expectancy

In the absence of accident, abuse, or misapplication, the DS number divided into 50,000 signifies the average flex-fatigue life expectancy in total hours of operation for the quality belts indicated by this report. The flex-fatigue life expectancy arrived at in this calculation is an average life so that the life of any particular belt observed will be more or less by normal statistical deviation. This deviation will be approximately plus or minus 50 percent. (This compares with the fatigue life of ball bearings which may deviate plus or minus 90 percent from the average.) Since the flex-fatigue life calculated by this method is based on an assumed value of continuous horsepower, speed, tension, and ambient temperature, which may not be representative of actual service conditions, the hours of flex life calculated, from the DS number, represent design objectives only and do not indicate clock hours of service.

Conclusion

We have tried to show the relationship between the parts of a complete V-belt drive design and some factors that should be considered, and how the life-load relation is a useful guide in the process of fitting the drive to the designers' objectives. Of these ten factors in drive design — capacity, takeup, space, hub load, tolerance for misuse, ease of replacement, slip, flex-life expectancy, dependability, and cost — flex-life expectancy is only one. We determined flex-life expectancy because the analysis tells us about the other factors as well. An "easy" drive is likely to have a low DS number. It will generally last longer, stretch less, have more constant speed ratio, occupy more space, require less attention, cost more initially, will weigh more, and have a greater tolerance for misalignment, abuse, and interference than a more "severe" drive with a higher DS number.

For detailed description of calculation procedure please request ASAE Paper No. 60-634 from ASAE, 420 Main St., St. Joseph, Mich. (Price, 50¢ per copy or one ASAE member order form.)

Overhead Irrigation Pattern Parameters

W. E. Hart
Member ASAE

Method is devised to match pattern parameters with irrigation requirements

THIS paper discusses some commonly used overhead irrigation pattern parameters. An attempt is made to demonstrate their interrelationships based on the assumption of normal distribution under an overlapped sprinkler pattern. Data are presented which partially justify the assumption. Finally, a method is presented whereby the layout man can develop pattern parameters to suit irrigation requirements.

Most parameters used for sprinkler distribution evaluations are computed from observations of precipitation within an array of the overlapped patterns of many sprinklers. This array can be developed in many ways. One is to place sprinklers at the spacing to be investigated. Enough sprinklers must be operated during the test so that all sprinklers which would throw water into the overlapped pattern area are included. Another method is to obtain the distribution from a single sprinkler and, by calculation, overlap enough of these to obtain the overlapped pattern desired. This method has the advantage of requiring considerably less testing time and was used in obtaining the data presented in this paper. In the discussion of parameters the term "pattern" refers to the overlapped pattern mentioned above. The term "observation" refers to the precipitation depth at a point within the pattern. The term "normal" is used in the statistical sense and refers to a Gaussian distribution of observations.

Uniformity Coefficient

Christiansen (1)† first presented the concept of uniformity coefficient in sprinkler distributions. Expressed as a fraction, it is

$$UC_C = 1 - \frac{\Sigma|X_i - \bar{x}|}{n\bar{x}} \qquad [1]$$

in which UC_C is Christiansen's uniformity coefficient, $\Sigma|X_i - x|$ is the sum of the absolute deviation of individual observations *(X_i)* from the average of the observations *($\bar{x}$)*, and n is the number of observations.

For a normal distribution curve $\Sigma|X_i - \mu|/n = \sqrt{2/\pi}\sigma$, where μ is the arithmetic mean of the universe and σ is the standard deviation of the universe. Thus, $\Sigma|X_i - \bar{x}|/n$ equals approximately $0.798s$, where s is the standard deviation of the sample. Substituting this in equation [1] the following is obtained:

$$UC_H = 1 - 0.798s/\bar{x} \qquad [2]$$

where UC_H (HSPA uniformity coefficient) is used to distinguish values computed by equation [2] from those computed by equation [1].

Equation [2] has certain desirable attributes. First, for unarrayed data, s is considerably easier to compute than $\Sigma|X_i - \bar{x}|$, especially if a desk calculator is available. Second, and more important, the uniformity coefficient can be shown to have a physical interpretation useful in predicting the performance of irrigation systems. To show this, rewrite equation [2] as

$$UC_H\bar{x} = \bar{x} - 0.798s \qquad [3]$$

The area under a normal curve from $\bar{x} - 0.798s$ to $+\infty$ is 79 percent of the total area under the curve. $UC_H\bar{x}$ is the lower limit of X_i in this fractional area. It can thus be said that 79 percent of the pattern area will receive an application of $UC_H\bar{x}$ or more if the distribution is normal.

Pattern Efficiency

The USDA recommends the following parameter for the evaluation of overlapped sprinkler patterns (3):

$$PE_U = X_i^*/n^*\bar{x} \qquad [4]$$

in which PE_U is the USDA pattern efficiency (expressed as a fraction), ΣX_i^* is the sum of the 25 percent of the observations having the lowest values, n^* is the number of observations used in computing ΣX_i^*, and $\bar{x}$ is the average of all observations in the pattern.

The expression $\Sigma X_i^*/n^*$ is the average of the lowest 25 percent of the observations. By again considering a normal distribution, the point $X = \Sigma X_i^*/n^*$ corresponds to the value $\bar{x} - 1.27s/\bar{x}$. (This point has about 10 percent of the observations lower than it and about 90 percent higher.) An expression relating pattern efficiency and $s/\bar{x}$ can now be developed from equation [4].

$$PE_H = 1 - 1.27s/\bar{x} \qquad [5]$$

in which PE_H is the HSPA pattern efficiency. For a normally distributed system of observations $PE_U = PE_H$. Like UC_H, PE_H can be easily calculated from unarrayed data.

Normal Distribution of Overlapped Sprinkler Patterns

The assumption of a normal distribution of observations under an overlapped sprinkler pattern was tested using the above equations for uniformity coefficients and pattern efficiencies and data obtained from sprinkler tests. Data group I consisted of 166 tests of small (4 to 12 gpm) sprinklers operating individually in winds up to 20 mph. These were overlapped (by calculation) on spacings of

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The author — W. E. HART — is research engineer, Hawaiian Sugar Planters' Association, Honolulu, Hawaii.

†Numbers in parentheses refer to the appended references.

30 x 30 to 60 x 40 ft, giving a total of 1558 patterns. Data group II consisted of 466 calculated overlapped patterns obtained from tests of individual sprinklers having discharges up to 300 gpm and operating in winds up to 20 mph. The maximum pattern spacing was 200 x 300 ft.

Christiansen's uniformity coefficient was compared to the HSPA pattern efficiency using data groups I and II. A linear regression analysis resulted in the following:

$$UC_C = 0.3859 + 0.6022\,PE_H \quad (R^2 = 0.888) \qquad [6]$$

where R is the correlation coefficient. By manipulating equations [2] and [5], the definition equations of UC_H and PE_H, and equation [6], the following was obtained:

$$UC_C = 0.0300 + 0.958\,UC_H \qquad [7]$$

Data group I was applied to the expressions for pattern efficiency by computing PE_H and PE_U for each pattern. From these calculations a linear regression analysis was also run. The equation obtained was

$$PE_U = 0.0782 + 0.935\,PE_H \quad (R^2 = 0.914) \qquad [8]$$

The average values of PE_H and PE_U for the data were 0.662 and 0.698, respectively.

The high correlation coefficients indicate that PE_U and UC_C are reliably estimated by PE_H and UC_H. PE_H and UC_H were developed from normal curve considerations. Therefore, the distribution under an overlapped sprinkler pattern appears to be fairly well defined by the normal distribution function.

Additional Parameters

Other investigators have considered distribution parameters based upon a normal distribution. As an example, Strong (2) used Pearson's variability coefficient, defined as

$$V = s/\bar{x} \qquad [9]$$

in which V is the variability coefficient. He stated that a V score of 0.20 or less or a uniformity coefficient of 0.84 or greater indicated acceptable water distribution. If a value of V (or $s/\bar{x}$) of 0.20 is placed in equation [2], UC_H is found to be 0.84. Thus there is agreement between the two parameters UC_H and V under conditions that are considered acceptable.

Strong (2) also feels that a standard deviation of 0.10 in. is the maximum allowable for intermediate pressure (30 to 60 psi) sprinklers. Substituting this value and the acceptable uniformity coefficient of 0.84 into equation [2] shows that this supposes an average application of 0.5 in. If this is obtained in a one hour test, it indicates an application rate of 0.5 in. per hour, which is reasonable to expect with these sprinklers.

Use of Normal Distribution Concept

By assuming the observations to be normally distributed under an overlapped pattern, it is possible to design parameters which will tell what fraction of an irrigated area will have a given minimum application or what fraction of an area will have an application between two limits. Consider the following expression:

$$PE_A = 1 - bs/\bar{x} \qquad [10]$$

in which PE_A is called the area pattern efficiency. A, the subscript, is a fraction chosen so that $100(1-A)$ percent of the area will have an application of $PE_A\bar{x}$ or more, and 100 $(1-2A)$ percent of the area will receive an application between $PE_A\bar{x}$ and $(2-PE_A)\bar{x}$. The factor b depends on A and is determined from normal distribution relationships. Corresponding values of A and b are shown in Fig. 1.

As an example in the use of the parameter assume that a pattern has an average application of $\bar{x}=0.42$ in. and a standard deviation of $s=0.11$ in. It is desired to know what the minimum application would be on 75 percent of the area. A is therefore 25 percent and the value of $1-A$ is 75/100, or 0.75; from Fig. 1, b is determined to be 0.67. PE_A (*or* $PE_{0.25}$) is 0.738‡. Thus 75 percent of the area has an application of 0.31§ in. or more. One can also say that 50 percent of the area (100 $[1-2A]$, from Fig. 1) has an application between 0.31 and 0.53‖ in. A similar procedure is used if application rates are desired.

Computations such as those described allow the system designer to evaluate distribution characteristics of a system according to crop and economic requirements. A shallow-rooted crop or a water supply that is expensive or scarce might dictate a high area pattern efficiency. Similarly, a deep-rooted crop or an inexpensive water supply might allow a low pattern efficiency. The method thus allows effective matching of crop requirements, equipment costs and water value (or cost).

References

1 Christiansen, J. E. Irrigation by sprinkling, California Agricultural Experiment Station, Bulletin 670, 1942.

2 McCulloch, Allan W. and Schrunk, John F. Sprinkler irrigation, Sprinkler Irrigation Association (first edition), page 459, 1955.

3 Criddle, W. D., Davis, Sterling, Pair, Claude H. and Shockley, Dell G. Methods for evaluating irrigation systems, USDA Soil Conservation Service Handbook No. 82, 1956.

‡$PE_A = 1 - 0.67\,(0.11/0.42) = 0.738$

§$0.738\,(0.42) = 0.31$

‖$(2-0.738)\,0.42 = 0.53$

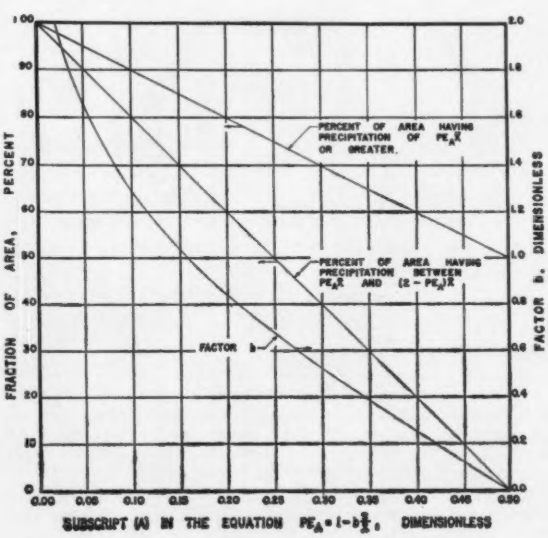

Fig. 1 Area pattern efficiency factors

Tower Silo Design

With particular reference to concrete-stave construction

C. K. Otis and J. H. Pomroy
Member ASAE *Assoc. Member ASAE*

MOST engineers are well acquainted with general design procedure for tower silos to be used for either silage or grain storage. Since the best information available to date is brought together in a booklet, entitled "(ACI-714) Recommended Practice in the Construction of Concrete Farm Silos" (1)*, routine design procedures will not be described in this paper, but rather some design considerations will be presented that may not occur to one using available data and the usual design assumptions.

It should be pointed out at the outset that design procedures based on the assumption that silage acts like a liquid must be considered incorrect. Silage does not act like a liquid nor like granular particles. It is a unique material and its properties, some of which are unknown, depend on many factors.

Unfortunately many silo design requirements are based on past failures. Since there are usually several possible causes for failures, acting either singly or in combination, and the investigator gets to the scene after failure has occurred, it becomes difficult to track down the weakness most likely responsible.

Fig. 1 shows diagramatically some of the critical points in silo design.

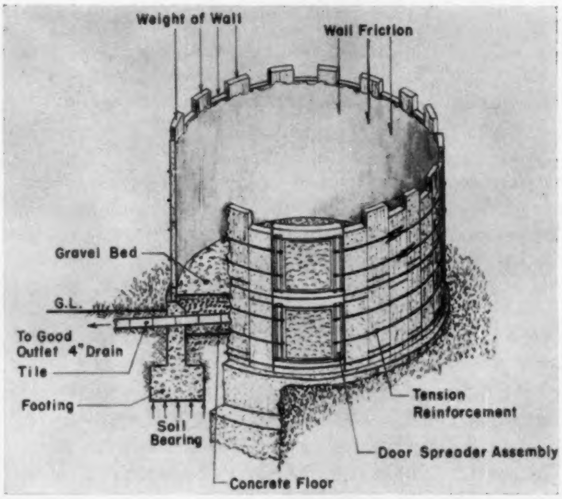

Fig. 1 Essential features to be considered in designing a silo

Foundation

A good footing is important to distribute the weight of the silo and its contents over a sufficient area of the soil so that the bearing capacity of the soil is not exceeded. The bearing capacity of the soil varies with its moisture content. If heavy juice flow from direct cut silage is permitted to seep into the soil, the bearing capacity is reduced considerably.

If this juice flow is such that one side of the silo is on dry soil and the other on very wet soil, equilibrium is upset and an overturning moment of considerable magnitude is set up.

Bottom Drainage

A good drain at the bottom of the silo protects the foundation and assures against this type of failure. The best drainage system consists of a concrete floor sloped toward a tile line placed across the diameter and carried on a slope through the foundation wall to a good outlet. Covering this tile line and the entire floor is a gravel bed 10 to 12 in. deep. Such a drain not only protects the foundation but also helps prevent any build up of hydrostatic pressure caused by trapped juice.

Tension Reinforcing

The silo wall must be adequately reinforced against the expected lateral pressures. These pressures have been estimated for silos up to and including 18 feet in diameter (1, 2). As with much of the existing engineering data, specific values from one source do not agree with those from another and the designer's judgment must be applied. Adequate reinforcing entails not only tension resistance by the reinforcing rods but also bending stresses due to eccentric loading at the lugs or connectors. The lugs themselves must be strong enough to take any load that the rods may place upon them. Often a source of weakness is the spreader harness that carries the hoop tension across chute doors. In Fig. 1 if deflection in the channels under load plus the elongation of the hoops attached to them exceeds the elongation of the continuous hoops above and below the opening, some of the load carried by these hoops is transferred to the continuous hoops with the result that these may be overloaded to the point of failure before the harness can take its full share of the load. If one hoop breaks, its load is taken up by adjacent hoops, thus overloading them. Some thought should be given to eliminating spreaders and increasing the length of the overlap at stave joints. This could be done by eliminating every other chute door and making staves 5 ft long instead of 2½ feet, thus permitting continuous hoops between doors. Some reinforcement of staves may be needed if such a scheme is used.

In a concrete stave silo it is essential that hoops be pretensioned. If hoops are tightened to full allowable stress, it will keep the concrete staves under compression until the design lateral pressure has been exceeded. This is important since it assures tight vertical wall joints. Tight joints

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*Numbers in parentheses refer to the appended references.

protect the silage from entrance of air, help to prevent seepage of excess juice and protect the interior coatings. If an overturning moment develops, vertical tension forces must be resisted by friction between staves at the overlap. Friction is also required in vertical joints to resist tilting of the silo wall without lifting it from the foundation. Any tilting of this nature enlarges the cross section around which the hoop is stretched, thus increasing the tension in the rods. The possibility of these types of failure suggest the need of vertical and diagonal reinforcement or ties. In pretensioning the hoops it is necessary to have a sufficient number of lugs so that uniform tensioning can be accomplished by drawing up the rods in short lengths to offset resistance due to rod curvature and friction between staves and rod. Rods should be from 10 to 16 ft in length, depending on the diameter of the silo, with the shorter lengths on silos of the smallest diameter. Monolithic silos could also be hooped externally to permit pretensioning and thus reduce the possibility of vertical wall cracks when the silo is filled.

Walls

Wall thickness and durability are important since sufficient bearing strength must be provided, during the life of the structure, to support the weight of the wall plus the friction load of the settling silage. Wall friction may reach ninety percent of the entire weight of the silo contents, depending on the diameter and height of the silo and the filling method used. On silos of large diameter, where curvature is slight, wall thickness becomes important in maintaining a cylindrical shape when acted upon by non-uniform or eccentric placing of the crop or external horizontal loads, such as wind when the structure is empty. The material must be of sufficient durability to last as long as other materials used in silo construction. Fig. 2 shows a silo failure in which durability of wall material played an important part. Such failures occur shortly after filling, when the wall friction load is at its maximum. In this case frost action over the years had weakened the wall material until it could no longer resist this load. It is probable that this, coupled with an overturning moment by non-symmetrical placing of the crop combined to tip the silo. When the silo hit the ground, the only hoop that was broken was the one that had been stretched by a pole the farmer had used to try to prop up the silo.

Fig. 2 Failing wall material and non-symmetrical filling combined to tip this silo

Fig. 3 The condition of the crop and the procedure used in filling this silo appeared responsible for overturning it soon after refilling

Fig. 4 A dense pillar of silage stands 15 to 20 ft above the ground surrounded by 900 tons of silage from an overturned silo that had been filled for the first time

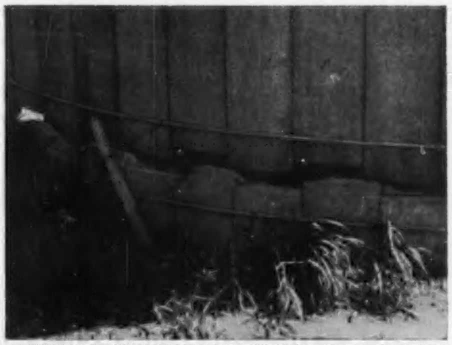


Fig. 5 Inadequate overlap at stave joints in this silo resulted in separation of the wall during a windstorm

Distribution of Crop When Filling

When tower silos were first introduced, it was common practice to keep a man in the silo to level and tramp the incoming material. With this system a rather uniform symmetrical density pattern was assured. Today many silos are filled with little or no regard to uniform distribution and a dangerous internal moment can be developed in the mass due to the formation of dense pillars that are not symmetrically placed. Fig. 3 shows an overturned silo that appeared to be a victim of poor distribution of the crop. (Later the reader will see a density diagram that will illustrate how this can develop.) Evidence that these pillars do exist is shown in Fig. 4. This pillar remnant was photographed the day following the overturning of a 24 x 65-ft silo in Wisconsin. The pillar rose some 15 or 20 ft above the ground and was located opposite to and in line with the direction of fall of the silo. The huge pile of silage that surrounds the pillar represents 900 tons from 52 acres of a heavy crop of corn, chopped to a length of ⅜ in., and twenty days of filling time. The first evidence of failure was reported as a broken hoop 45 ft above the ground. In a matter of a few minutes after this break the silo was on the ground, with most of the hoops broken. In this instance lugs at the rod connections appeared to be the weak link in the chain.

The concrete stave silo as usually built has a wall made up of many small rectangular pieces held together by horizontal tension members. Rarely, if ever, is the wall secured to the floor. So in effect we have a hollow cylinder surrounding a mass of silage that may or may not have leaning tendencies, depending on how it is filled. When an overturning moment of sufficient magnitude to overcome the weight of this wall is developed, part of the wall may be placed in vertical tension. If the concrete, which is notably weak in tension, does not fail, the only other resistance to this force is the uncertain friction between staves at an overlap of six inches or less (Fig. 5). If hoops are heavily stressed at the same time, the friction at these joints is reduced. Overturning failures are often reported where separation does not occur at the foundation but at levels 10 or 12 ft above the ground.

The importance of method of distribution at filling time becomes more and more evident as silos become larger and filling operations become more mechanized. Conservative engineering would suggest building silos that would withstand any load that might be placed on the structure regardless of how it was filled or emptied, but silos are not constructed to conservative engineering standards and farmers need to be warned of the possible consequences of improper filling methods.

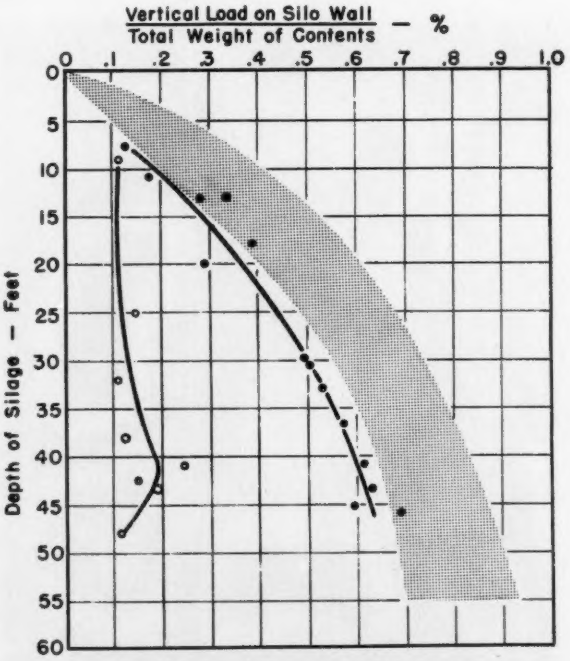
Filling Methods vs. Lateral Pressures

Preliminary investigation has indicated that there may be an effect of filling methods on the wall friction load (Fig. 6). The shaded band encloses six curves, prepared by H. J. Barre, derived from data obtained by McCalmont and Besley with calibrated sidewall panels. These curves were prepared from data representing six silos of varying diameter, containing various crops at various moisture contents. The experimental 14 x 45-ft silo used at the Minnesota Station has never been equipped for measuring lateral and wall friction loads, but it has been equipped for measuring bottom pressures. Since the ratio of vertical load on the silo wall to the total weight of the contents could be computed from bottom pressures, it seemed a good opportunity to compare for agreement results obtained by the two different approaches. The combined results of two years of investigation at Minnesota are shown by the left-hand curve in Fig. 6. The maximum load carried by the wall was approximately 25 percent of the total and this occurred before the silo was full and dropped off rapidly after filling was completed.

Since these two years of data showed startlingly different results, when compared to Barre's, there must be some reason for the difference. This encouraged us to look for more evidence. Although not as complete, bottom-pressure data from two other seasons appeared quite reasonable for the period up to and for a short period after filling was completed. This data was combined in the same way to get the right-hand curve. Since this curve approximates the lower limit of the band covering Barre's curve, it appears that results from those two years agreed quite well with his ratios obtained by measurement of sidewall friction loads. For the four seasons represented by the Minnesota data, the same crop (alfalfa-brome) was put in the silo at essentially the same average moisture content.

Thorough study of the data does not offer a clear-cut explanation for this large difference in wall friction load. Of the various factors involved, the method of filling the silo appears to be the most likely cause for difference in the two sets of Minnesota data. The fillings represented by

(Continued on page 363)



EFFECT OF FILLING METHODS

Fig. 6 The ratio of the vertical load on the silo wall to the total weight of the silo contents plotted against silage depth. Each curve shows results of two years of study using bottom pressures for the calculations. The shaded band encompasses six curves using sidewall friction measurements

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1961-62
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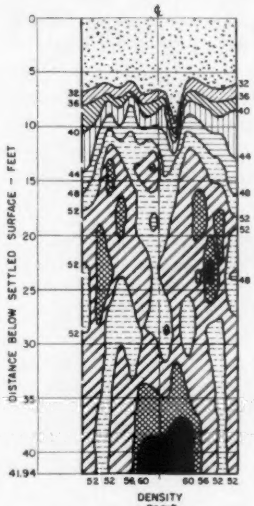
. . . Tower Silo Design

(Continued from page 358)



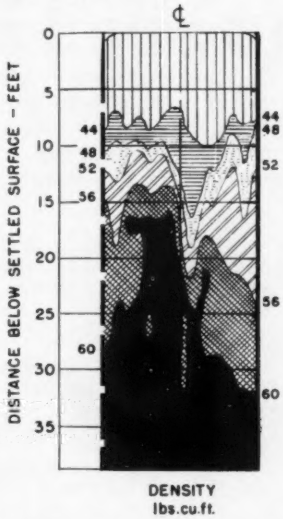


Fig. 7 ***(Left)*** **Density distribution is symmetrical about the center line of the silo when using a mechanical distributor during the filling operation. • Fig. 8** ***(Right)*** **An eccentric core of dense silage may introduce an overturning moment within the silo**

the left-hand curve were accomplished with a rotating mechanical distributor that threw the silage to the walls forming a large funnel-shaped mass that built up at the periphery until it toppled to the center when it could no longer stand alone. Fig. 7 shows a density diagram for this type of filling representing a cross section of the silage mass. Core samples supplying data from which this diagram was made were taken just before feeding commenced or about four months after filling. The dense silage seems to be where the material was deposited by the distributor at filling time, which in this case is in the form of a cylindrical shell well away from the center and close to the wall.

Although one of the pair of fillings on which the right-hand curve of Fig. 6 is based was accomplished with the same distributor, the average moisture content of the material was somewhat higher, and our notes indicate that we were having trouble with small green particles building up on the deflection plate and drive rotor of the distributor which interfered with its proper action. Although the average densities indicated fairly uniform distribution, the pattern did not show the greater concentration of the denser material near the wall. Fig. 8 shows the density diagram for the other one of this pair where a distinct pillar of dense silage has been built up. This filling was accomplished by directing the flow of silage from the goose neck of the filler pipe to the approximate center of the silo, and after every two or three loads a man entered the silo and leveled the surface. Core samples from the base of this pillar gave densities of over 70 lb per cubic foot, indicating that a substantial proportion of the silage above was being supported by it. It may be noted that the center of this pillar is off center in the mass. Although in this case the silo did not fail, conditions were favorable for the development of a sizable overturning moment.

Another thing that might have a bearing on the results is a moisture factor. The two fillings that showed light sidewall loads were partially wilted and variation of moisture content between loads was quite pronounced. Although the average moisture contents of the two were almost identical with the filling in which no mechanical distributor was used, the latter had much less variation in moisture content.

A third possibility is that there is a difference in the way the two pairs of bottom pressures were measured. In the pair showing the greatest bottom pressure, indicating a light wall load, the plane on which the pressures were measured was about 3½ in. above the gravel surface at the bottom with ramps built up around the device, so that there was no abrupt dropoff to the gravel surface. The other pair of pressures was measured on a plane flush with the gravel surface. This factor may have little effect on the results, but when working with silage one must be expecting surprises. So until this factor has been evaluated, we cannot be sure that the method of distribution makes the difference, or, for that matter, whether a difference actually exists.

It is important, however, to follow up this possibility. If, as it appears from this data, a substantial reduction in wall friction load can be obtained by distributing the green crop in this way, then it would be reasonable to expect that lateral pressure would also be reduced since the coefficient of wall friction would remain the same regardless of how the material went into the silo. It would then follow that a greater factor of safety might be provided with conventional hooping if this method of distribution is used.

It is not known how a wall is affected by distribution that keeps the silage surface level at all times, but with either method of mechanical distribution the formation of dense pillars in the silage can be avoided. Although the role of these pillars is not clearly understool, they were found to be present at some otherwise unexplained silo failures, where overturning was involved.

Summary

The following points are important in the design of a good tower silo of concrete stave construction:

1 A good footing on undisturbed soil at least 3 ft below grade and of sufficient area to distribute the weight of the silo and the friction wall load over the soil without exceeding its bearing capacity.

2 A reinforced monolithic wall extending from the footing to 6 or 8 in. above the grade line on which the bottom end of the staves will rest. Solid precast concrete staves can be carried below the ground to the footing as an alternate. No hollow cores should be tolerated below ground and external reinforcing should be well coated with a bituminous paint to protect them from soil moisture and seepage.

3 A good drainage system should be provided in the bottom of the silo, consisting of a concrete floor sloped to bring juice to a draintile placed across the diameter and carried through the foundation wall to a good outlet some distance from the silo. To assure good drainage from all parts of the bottom, a 10 to 12-in. deep layer of gravel ¾ to 1 in. in size should be spread over the floor and covering the tile.

4 Wall staves should be of durable concrete. For diameters larger than 20 ft, staves should be thicker than 2½ in. Consideration should be given to using larger units to permit omission of spreaders and to increase the length of overlap at stave joints.

. . . Tower Silo Design

5 Spreaders for door openings should be avoided whenever possible, but where used should be strong enough to resist loads equal to that carried by adjacent continuous reinforcing without excessive deflection.

6 Rod connection lugs should be designed to resist the ultimate tension load of the rods they connect and to resist the twisting imposed on them by the eccentricity of the joint. Or better yet, a rod connection that will eliminate eccentricity should be found. Sufficient lugs per hoop should be used to insure uniform tension in the rods.

7 Consideration should be given to vertical and diagonal reinforcement to aid in resisting overturning moments introduced by careless or improper filling methods.

8 Mechanical distribution of the material when filling should be encouraged to reduce the possibility of non-symmetrical loading and formation of silage pillars.

Research Needed

With tower silos becoming more and more important in the mechanical feeding systems for livestock, it appears that a research program is needed to find answers to structural problems. Silos now being built are larger in diameter and higher than silos on which present design data were based. In studying silage pressures, bottom pressures should be obtained simultaneously with sidewall pressures so that a check is provided one against the other. Filling and emptying such silos for experimental purposes should not have to depend on growing crops or feeding animals. Perhaps stub silos could be built that would require less silage but with means of simulating great depths by evacuating air from the silage or by supplying air or water pressure to the surface. In this way several fillings and emptyings could be accomplished each year speeding up results and permitting the study of new approaches to silo design.

References

1 American Concrete Institute, (ACI-714) Standard, "Recommended practice for the construction of concrete farm silos." Journal of the American Concrete Institute, 18:(2) 149-164, October 1946.

2 Farm Silos, USDA Misc. Publ. 810, April 1960.

3 McCalmont, J. R. Krueger, W. C. and Eby. C. Pressures and other factors affecting silo construction. New Jersey Agricultural Experiment Station Bulletin 731.

4 Barre, H. J. Unpublished curves showing effect of silage depth on ratio of wall friction load to total weight silo contents.

5 Otis, C. K. and Pomroy, J. H. Density: a tool in silo research, AGRICULTURAL ENGINEERING, 38:(11) 806-807. November 1957 and 38:(12) 860-863. December 1957.

6 Minnesota Agricultural Experiment Station. Unpublished data on bottom pressures in an experimental silo, Project 1203H. 1949-58.

. . . Feed Grinding Studies

(Continued from page 352)

dicated in Fig. 2. The material retained on the sieves of 14, 28, and 48 mesh appeared to be mainly fiber, which was grossly dissimilar to the material on the 8-mesh sieve and the starchy material on the 100-mesh sieve and on the pan. These dissimilarities further complicate the appropriateness of the procedures herein discussed and point out *the second engineering challenge:*

Analyze the ground feed sizing system and consider an improved procedure.

An improved procedure would probably be one that would recognize and indicate the shape of particles as well as dimensions and quantities. Such a system would probably be complicated and expensive, and might be insufficiently superior for recommended use. Nicholas and Hall (10) provided some insight into the problem by their analysis of the meaning of a size designation. Additional studies appear most pertinent to the problem. Even though the currently used sizing system is technically faulty, its simplicity may make it the most acceptable.

References

1 ASAE Recommendation: Method of Determining Modulus of Uniformity and Modulus of Fineness of Ground Feed. AGRICULTURAL ENGINEERING YEARBOOK, ASAE, St. Joseph, Mich.

2 Bathe, Greville and Bathe, Dorothy. A chronicle of early American engineering by Oliver Evans. The Historical Society of Pennsylvania, 1935.

3 Bennett, Richard and Elton, John. History of corn milling. Vol. I. Handstones, Slave, and Cattle Mills, 1898. Vol. II. Watermills and Windmills, 1899. Vol. III. Fendal Laws and Customs, 1900. Vol. IV. Some Fendal Mills, 1904 Simpkin, Marshall, and Co. Ltd., London.

4 Bohstedt, G. Feed grinding. What feed, why, when, how fine? Wisconsin Agricultural Extension Service Cir. 286.

5 Crampton, E. W. and Bill, J. M. The effect of fineness of grinding on the utilization of oats by market hogs. Journal of Animal Science, 5:200-210, 1946.

6 Henderson, S. M. and Perry, R. L. Agricultural process engineering. John Wiley and Sons, Inc., 1955.

7 Kick, F. Das gesetz der proportionalen widerstande und seine anivendung. Leipzig. 1885.

8 Kleis, R. W. and Neumann, A. L. Cattle neutral on feed grinding methods. AGRICULTURAL ENGINEERING 37:544, 547, 1956.

9 Martin, J. W. and Roberts, J. Feed grinding with small electric motors. Kansas Agricultural Extension Bulletin 87, 1941.

10 Nicholas, R. C. and Hall, C. W. Particle size designation analysis. TRANSACTIONS OF THE ASAE 3:(2)111, 112, 1960.

11 Payne, Lloyd. The miller in eighteenth-century Virginia. Colonial Williamsburg.

12 Rittinger, P. R. von Lehrbuch der Aufbereitungskunde. Ernst and Korn, Berlin, 1867.

13 Russell, H. G. What feeds does it pay to grind for farm animals? Ill. Dept. of Agricultural Engineering Leaflet 277, 1940.

14 Silver, E. A. Characteristics of feed mill performance. AGRICULTURAL ENGINEERING 13:31-34, 1932.

15 Silver, E. A. Feed grinder investigations. Ohio Agricultural Experiment Station Bulletin 490, 1931.

1960 Engineering Enrollment Statistics

STATISTICS covering enrollments in all engineering schools in the United States with one or more curriculums accredited by the Engineers Council for Professional Development are assembled each year by The American Society for Engineering Education and the Office of Education in the Department of Health, Education and Welfare and are published in the *Journal of Engineering Education.* According to this report, for the first time in three years, there has been only a slight decline in engineering enrollment in institutions having curriculums accredited by ECPD. It is also reported that freshmen enrollments in these institutions in the fall of 1960 were slightly larger (1.2 percent) than in the fall of 1959. The report states that this is an early indication that within the next year or two, total undergraduate engineering enrollments may once again show annual increases typical for this major field of study. It also points out that total engineering enrollment for advanced degrees continued to show increases in 1960 – but not large enough to offset in total number of students the decline in undergraduate registration.

Timing Control for an Increasing Absolute Daylength

Ralph E. Smith
Member ASAE

RECENT interest has focused on the effect of an increasing absolute daylength with laying hens as compared to the maintenance of an optimum constant daylength. An automatic timing control was developed, for use in a lighting study with laying hens, by the agricultural engineering department of the University of Georgia College Experiment Station, that produces a gradually increasing absolute daylength. Conditions that determined the design of this experimental switch were: *(a)* the natural daylength to be supplemented to obtain the desired absolute daylength, *(b)* an increase of the daylength to be about 1½ minutes added daily (this being approximately the increase occurring naturally during March and April), *(c)* supplemental lighting to be used during the morning hours, and *(d)* operation to be automatic with weekly settings of the timer.

Since the time-control devices available would neither perform the desired functions nor have the accuracy and sensitivity required, the experimental switch was developed from components that are readily available. The Eagle microflex reset timer with a sensitivity of 1 minute and an accuracy of ± 1 minute measures most of the timed period. A reset timer was selected that does not reset on power interruption, so that short-interval interruptions would have a negligible effect on the performance of the switch. The total cost of components for the switch was about \$150.

The circuit diagram (Fig. 1) shows the components and their arrangement. The photorelay used is a Knight kit with a 6.3-volt a-c output from a relay actuated by a lowering light intensity. Control of the switch by the photorelay is through the 6.3-volt thermal-delay relay K_5 introduced for stability of operation. The selection and arrangement of relays K_1, K_4 and K_5 permit the switch to return to its prior function with the return of power following an outage. This feature is particularly desirable for short time-interval outages where little error would be introduced in the timed period.

The operation of the switch begins at an arbitrarily selected time when the average light intensity from natural daylight on the floor of the laying pen lowers to ½ footcandle. This occurs about 10 minutes before sunset time on a normal, clear day. On closing of the photorelay and the thermal-delay relay K_5, a signal reaches the reset coil of the reset timer. Contacts 2 to 4 of the timer close energizing the thermal element of K_7. Closing of K_7 after 2 seconds terminates the signal to the reset coil by energizing the coil of the alternate pulse relay K_3. Closing of K_3 initiates a pulse to the stepping coil that terminates by the opening of K_6. After timing of the set interval on the reset timer, contacts 1 to 3 close and energize the pointer of the stepping switch. A variable decreasing interval of time is measured by the series of thermal delay relays, K_8 to K_{13}. As K_{13} closes an impulse is sent through K_3 to the coil of the power relay K_2 and energizes the output. After the 2-sec delay of K_7, the alternate pulse relay is switched to its initial position. The output remains energized as long as the photorelay remains closed and the switch is in condition for another cyclic operation. The fixed time of the reset timer is manually reduced by 10 minutes each week.

Four of these experimental switches have been constructed and are presently being used in lighting studies with laying hens. The operation of the switch was monitored by adapting a recording voltmeter. The accuracy and sensitivity of the monitoring arrangement is less than that of the switch but it indicates an accurate control of a decreasing dark period. Since the switch controls the dark period, daily weather conditions have an effect on the length of the absolute daylength. This effect occurs only in the evening so that the variation of daylength about the trend would be less than that which occurs with changing natural daylength in the spring.

The timing control switches have been successful in producing a gradually increasing daylength for laying hens. The principles used in the switch could be applied to many other applications. A reversal of the leads on the six thermal-delay relays would give an increasing timed period and the incremental change in the timed period is determined by the selection of relays with the desired delay. The operation of the switch might be actuated by a number of other cyclic phenomena.

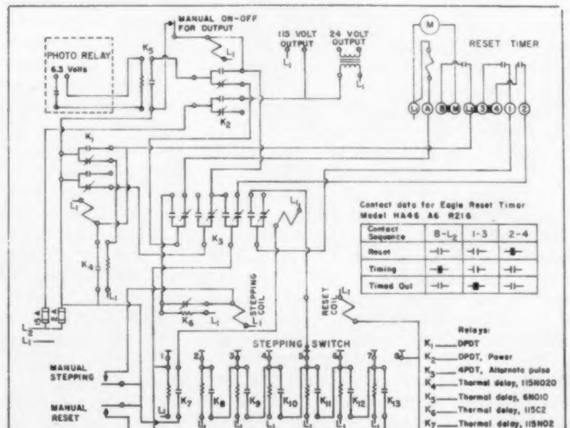


Fig. 1 Circuit diagram of an experimental automatic timing control which produces a timed interval that decreases by 1½ min for each cyclic operation

An Instrument News Contribution. Articles on agricultural applications of instruments and controls and related problems are invited by the ASAE Committee on Instrumentation and Controls, and should be submitted direct to Karl H. Norris, instrument news editor, 105A South Wing, Administration Bldg., Plant Industry Station, Beltsville, Md.

The author — RALPH E. SMITH — is instructor and assistant agricultural engineer, University of Georgia, Athens.

1961 ASAE Award Winners

The American Society of Agricultural Engineers awards annually The Cyrus Hall McCormick Medal for "Exceptional and Meritorious Engineering Achievement in Agriculture," the John Deere Medal for "Distinguished Achievement in the Application of Science and Art to the Soil," and the Metal Building Manufacturers Association Award for "Distinguished Work in Advancing the Knowledge and Science of Farm Buildings." Presentations of the 1961 Awards were made during the Society's 54th Annual Meeting at Iowa State University, Ames, June 28.

THE CYRUS HALL McCORMICK MEDAL
Was Awarded to John R. Orelind

J. R. ORELIND

"A MAN possessed of exceptional engineering skill and good common sense, with the ability to translate both into sound farm equipment design." Thus does a group of fellow engineers evaluate the man — John R. Orelind — selected to be the 1961 recipient of the Cyrus Hall McCormick Gold Medal, awarded annually by the American Society of Agricultural Engineers.

The award honors a man whom a former supervisor rates as a "tremendously capable engineer who possesses that rare spark of creative ability with which so many otherwise good engineers are not blessed." "I have always felt," he adds, "that one of Mr. Orelind's assets is his ability to analyze an engineering problem, get down quickly to the fundamentals involved, and then do something constructive about it."

John Robert Orelind was born March 18, 1893, on a fruit and dairy farm on the east coast of southern Sweden, a farm that is still in the Orelind family, now being operated by his brother. John — or "Bob" as he is perhaps best known to his many associates in the United States — grew up on this farm. After attending the local high school, he enrolled as a student at the Royal Institute of Technology, a division of the University of Stockholm, from which he graduated in 1916 with a degree in mechanical engineering.

Following graduation Mr. Orelind was awarded a travel scholarship to study tractors and power farming in the United States. While in this country he attended tractor demonstrations and visited a number of agricultural colleges, and in addition served a period of employment as a designer with both the Moline Plow Company and McVicker Engineering Company, the latter a firm of consulting engineers. In 1919 he returned to Sweden and accepted employment with Svalins Mekaniska Verkstad at Nyköping as a tractor designer.

Since it was then considered quite essential that a young Swedish engineer have German as well as American experiences, in 1920 Mr. Orelind entered the employ of Vereinigte Maschinenfabriken at Gumbinnen, Germany, as a diesel engine and tractor designer, where he worked until mid-1922, when the German inflation made it impossible for him to remain longer in the country.

Inasmuch as European conditions generally presented a discouraging outlook at the time, Mr. Orelind returned to the United States in 1922, where his first employment of about a year was as a tool designer at the tractor works of International Harvester Company in Chicago. He then entered the employ of the Robert and Shaefer Company of Chicago as a structural steel and machine designer. During the two-year period with this company, he attended evening classes in commercial law, business correspondence and business management on the Chicago campus of Northwestern University. All this time he was preparing himself for American citizenship.

The following ten years (1927-37), Mr. Orelind was employed as an implement designer by Moline Implement Company and its successor, Minneapolis-Moline Power Implement Company. While with this company he made many contributions to the design of disk plows, harrows, planters, moldboard plows and cultivators. One of his principal developments during this period was the two-way, roll-over moldboard plow, which is still a popular design in irrigation farming sections.

In December 1937, Bob Orelind again entered the employ of International Harvester Company to begin an unbroken period of more than twenty years of conspicuous engineering service in developing and improving the company's line of farm implements and tractors. Administrative duties over most of this period gave him less time for actual work on the drawing board. Nevertheless, besides many contributions made in the design of cotton pickers, sugar beet harvesters and other implements, Mr. Orelind originated such outstanding developments as the precision-type hydraulic control with integral rockshaft for farm tractors, the 4-way self-leveling hillside combine, the balanced head pitman-less mower, the power self-washing cream separator, and others. He was a leader in the development of quick-attachable mounted implements.

During his long association with farm equipment engineers, he has been credited with being a strong exponent of clean, simple design, neat in appearance, and adapted to economical manufacture. Many design engineers both of his own and other companies have expressed their appreciation for his guidance in helping them to develop into good, practical design engineers.

After rejoining the Harvester organization, the first assignment given Bob Orelind was that of implement designer at the company's Canton, Illinois, works. However, barely a year had elapsed when, on February 1, 1939, he was promoted from designer to chief engineer of the Canton works. A year and a half later another promotion came to him when, on August 1, 1940, he was placed in charge of engineering at four separate Harvester works — Canton, Illinois; Chattanooga, Tennessee; Richmond, Indiana; and Hamilton, Ontario (Canada) and moved to the company's main office in Chicago. In October 1944 Mr. Orelind's qualifications were given further recognition, when he was advanced to assistant manager of engineering of Harvester's farm implement division. However, the crowning promotion as a distinguished Harvester Company engineer came to him on April 1, 1953, when he was appointed manager of all the company's farm implement engineering, a position which he held until his retirement six years later. In conformity with company policy he retired on March 1, 1959.

During the years of Bob Orelind's employment as a design engineer, it is noteworthy that he was granted 51 U.S. patents on farm implements and tractors. Concerning this achievement a Harvester executive makes this significant comment: "In appraising the list of patents which bears his name, one is impressed with two things: The first, his wide range of interest and achievement

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THE JOHN DEERE MEDAL
Was Awarded to Virgil Overholt

IN selecting Virgil Overholt to receive the John Deere Gold Medal for 1961, the Jury of Awards of the American Society of Agricultural Engineers gives timely recognition to a career dedicated to applying sound, scientific knowledge to problems of drainage and water management on agricultural lands. "He has been a great teacher," observes one who has known him well over the years. "The impact of his humility, sincerity, and hard work has substantially influenced the standards, attitude and performance of the entire agricultural drainage industry."

Virgil Overholt was born at Bloomdale, Ohio, June 19, 1889, the son of Charles and Clara Overholt. He attended school at Hicksville, Ohio, graduating from high school there in 1909. During the following school year he taught a rural district school in Defiance County. Then in 1910 Virgil enrolled as a student in the college of agriculture at Ohio State University. At the end of two years, however, he interrupted his studies at the University for one year to teach mathematics and physics in the high school at Hicksville. Afterwards he re-entered the University to complete the last two years of the four-year curriculum, and was graduated in 1915 with a bachelor of science degree in agriculture with a major in agricultural engineering.

His record as a student was such as to win for him immediate appointment by the University, following graduation, as extension specialist in agricultural engineering for Ohio. Within two years following this appointment, however, Virgil Overholt's career as an extension engineer came to an abrupt temporary halt when he enlisted in the United States Army for overseas service in the horse artillery during World War I. He served thirteen months in France and was discharged in June 1919 with the rank of first lieutenant. He thereupon resumed his duties as agricultural engineering extension specialist for the state of Ohio, a position which he held for the next 37 years, except for a one-year period (1921-22) while he was on sabbatical leave for graduate study at the University of Wisconsin.

Following 1927, and in addition to his duties as extension agricultural engineer, Professor Overholt served as a member of the agricultural engineering resident teaching staff of Ohio State University, devoting one-fourth time to teaching courses in water management.

Official requirements for retirement of University staff members having caught up with Virgil in 1956, he retired with the title of professor emeritus. Since then, including other activities, he has been serving as a part-time consultant to the Hancock Brick and Tile Company, well-known manufacturer of vitrified draintile.

At the time Professor Overholt became agricultural engineering extension specialist

VIRGIL OVERHOLT

in Ohio, much of the state's arable land was in a low state of productivity due to improper drainage. Attempts at underdrainage up to that time had consisted in the main of running random tile lines to wet spots. Convinced that farmers could be greatly benefited by drainage systems properly planned and installed, Virgil conducted the first educational program in the state to

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METAL BUILDING MANUFACTURERS ASSOCIATION AWARD
Was Received by James S. Boyd

A DEDICATED agricultural engineer who devotes much of his time going about on farms and among farmers, studying and evaluating their building needs, in order that he may employ a truly realistic approach in his teaching and research programs in farm structures . . . that is the appraisal professional colleagues make of the man selected to receive the 1961 MBMA-ASAE Award, Dr. James S. Boyd, professor of agricultural engineering at Michigan State University.

James Sterling Boyd, the third recipient of the award, is a native of South Dakota, having been born at Webster, the son of Mr. and Mrs. Jacob Boyd. Jim attended the public schools at Volga and in 1935 enrolled as a student at the South Dakota State College, from which he graduated in 1939 with a bachelor of science degree in agricultural engineering and a major in farm structures.

Following graduation, Jim Boyd spent one year as graduate assistant in agricultural engineering at the A. and M. College of Texas. The next two years (1940-42) he was employed as a junior engineer by the U.S. Soil Conservation Service at a CCC camp in Kansas. The period 1942-45 was spent in the military service of his country, as an engineer officer of mine sweepers in the U.S. Navy. After his release from the Navy, he served a year as instructor in agricultural engineering at South Dakota State College.

In 1947, he accepted appointment as an assistant professor in the agricultural engineering department at Michigan State University. In addition to his duties as a member of the department staff, he earned the additional credits required for a master of science degree which was awarded him in 1948. He was thereupon advanced to the rank of associate professor. He was later granted sabbatical leave for advanced work at Iowa State University where he was awarded a Ph.D. degree in agricultural engineering in 1954 and in 1955 became full professor.

As head of the farm structures section in the agricultural engineering department of Michigan State University, Dr. Boyd has developed a balanced program of research, teaching and extension. His section staff has increased to seven members, four with Ph.D. degrees, two with M.S. degrees, and one on leave working for a doctor's degree.

His section now has twelve active research projects. Of these, Dr. Boyd is directly responsible for four: (1) Storage of high moisture corn in conventional silos; (2) structural characteristics of glass-

J. S. BOYD

reinforced plastics for farm buildings; (3) determination of bulk stresses in silage as stored in large-diameter tower silos, and (4) theoretical analysis and performance testing of primary and secondary stresses in glue-nail wood trusses.

Closely related to the section's research studies has been the program for graduate study in farm structures. Dr. Boyd has

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. . . Award Winners

JOHN R. ORELIND

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is quite obvious. The second, while not so obvious, is fully as important in a large organization such as ours, and this is the fact that virtually half the patents bearing his name also include the names of others. Bob Orelind always considered himself as part of a team; and despite the fact that he became a divisional manager of engineering and spent most of his years with the Harvester Company in positions of authority, he never failed to recognize and to credit the abilities of his associates, whether they ranked below or above him. Such an attitude can make the difference between success and failure in any organization, but it is particularly true in a large and complex one."

While his desire to encourage and help his fellow engineers may in a way have reduced public recognition of the broad scope and importance of his contributions to improving farm implements, this seems to have concerned Bob Orelind not at all. Examples of outstanding developments he has shared with others include the payout stake for corn planters, quick-attachable, "fast hitch," mounted implements, and the traction-control or weight-transfer implement hitch.

As evidence of devotion to his work as a design engineer, another former associate comments: "Although Mr. Orelind spent most of his time with the Harvester Company as an engineering executive, he always appeared to derive his greatest pleasure around the drafting board where the actual design was in progress. He always excelled in simplicity and in the application of correct engineering principles, and as a result he has taught many young engineers the great importance of common sense in implement design."

This same individual, in commenting on Bob Orelind's penchant for thoroughness in his design work, cites as an example one of his first assignments when he started to work for Harvester at the Canton, Illinois, factory. It was to build a two-way, two-bottom plow. So thoroughly did he design the job that the company still after 20 years manufactures the plow, and, to quote this onetime associate, "the trade still has nothing better to offer in competition."

In 1930, John Orelind married Miss Frances Pitkin of Forest City, Iowa. They have one son, Robert, who is a graduate mechanical engineer, having attended the Massachusetts Institute of Technology and the School of Mines and Technology at Rapid City, S. Dakota, and a daughter, Sylvia, who is a graduate of Wellesley College in Massachusetts and is now attending the Yale University Law School.

Questioned concerning his recreational activities and hobbies, Mr. Orelind replies that his duties as a design engineer and engineering executive, which included extensive traveling throughout the United States and abroad, has been so absorbing and interesting that he has felt no particular need for other diversion. He does, however, admit to much interest in photography and gardening, rose growing being his specialty, and he is continuing these activities in his retirement.

Perhaps no finer tribute can be paid than that of a former superior of Mr. Orelind: "One thing we in our company respected Bob Orelind for was the fact that he was always a gentleman. Whether with his fellow workers or with strangers, his personal conduct was always the same, and we heard many fine comments about him because of this." Another of Bob Orelind's traits, to which this same individual refers, was his ability to encourage young people. "He had confidence in youth. He felt that their ideas should always be considered, that they should be given the opportunity to present them and that they should always be encouraged to tackle tough problems."

The great admiration and respect shown in the tributes paid to Bob Orelind by his former business associates and friends are apparent in the warmth of their estimates of him as an engineer, as a leader, and as a real friend. This and the high esteem in which he is held by engineers generally in the farm equipment industry, combine to provide abundant evidence of this engineer's sterling qualities and the notable service he has performed directly for the farm equipment industry and indirectly for the agricultural industry.

VIRGIL OVERHOLT

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promote good drainage practice. He made use of meetings of farmers, field days, demonstrations, visits to farms, and publications. As the result of these efforts, he is accredited with having directly influenced the installation of well-planned, efficient drainage systems on well over one million acres of Ohio's best farm land. Ten million dollars a year is considered a conservative estimate of the value of the resulting production increase on this land.

Besides his work directly with farmers to improve land drainage practices, Professor Overholt has been of invaluable service to tile manufacturers in counseling them on the production of farm draintile of quality which would meet ASTM standards. He also did much to encourage and assist in the organization of the Ohio Drainage Contractors Association, the purpose of which has been to encourage construction of draintile systems of high quality. For years he conducted annual short courses for the Association, which have served as a model for similar associations in other states. In recognition of his invaluable service in advancing agricultural drainage technology, he was elected an honorary life member of the Ohio association.

Virgil Overholt is recognized as one of the really notable pioneers in the conservation of soil and water on the farm lands of the USA. As early as 1920 he saw the need for controlling soil erosion, when there was still little interest in it. That year he organized an erosion-control program in Ohio and conducted terracing demonstrations in seven southern counties of the state. Later during the 1933 national emergency, he assisted in organizing the first ten federally sponsored erosion-control camps. He has served also as a technical consultant to the USDA Soil Conservation Service ever since it began its operations in Ohio.

In recognition of his excellent service as a collaborator over a period of almost 25 years, the U.S. Department of Agriculture conferred the Superior Service Award on Professor Overholt on the occasion of his official retirement from Ohio State University in 1956. This award served as a most appropriate capsheaf to his long and distinguished career in the soil and water field.

Another phase of this man's notable service as an extension agricultural engineer has been his work in promoting safe and adequate water supply and sewage disposal on Ohio farms. In addition to cooperating with state and county health boards, he has held a great many meetings and demonstrations and made hundreds of farm visits in carrying out the extension programs he initiated.

Beginning in 1920, Virgil Overholt not only recommended but also designed many farm ponds as a practical source of water for spraying, livestock, fire protection and recreation in rural areas. Several thousand ponds have since been built on Ohio farms largely as the result of his efforts. In carrying out his program he worked closely with contractors to insure high quality of pond construction.

In his efforts to interest farmers in irrigation, he played an important part in developing standards for applying irrigation water on various types of soils and for different crops.

His reputation as a leader in applying sound scientific knowledge to drainage and other water-management problems in Ohio and adjacent areas, has earned for Virgil Overholt the title "Mr. Drainage," by which he is affectionately known to many coworkers and others who know of and have benefited from his dedicated career.

Professor Overholt joined the American Society of Agricultural Engineers in 1917, and because of his long membership record since then, together with his distinguished professional accomplishments in agricultural engineering, he is listed as a "Life Fellow" on the ASAE roll of members. He has also served as chairman of the Society's Soil and Water Division, and has participated in the activities of numerous committees, mainly those concerned with soil and water problems. He has also been a member since 1956 of the Soil Conservation Society of America.

Virgil Overholt's contributions to the science of water control and utilization on agricultural lands, not to mention other agricultural engineering subjects, go to make up a notable list of scientific papers he has authored and presented at ASAE and other professional meetings, and including those published as state and federal bulletins. In recognition of his eminent professional career, he was elected some years ago to membership in the honor society of agriculture, Gamma Sigma Delta, and he is a past president of the Society's Ohio chapter.

He served one term as a member of the Faculty Council of Ohio State University.

During 1950-54 he was faculty adviser to the Albright-Otterbein Fellowship, an organization of Evangelical - United Brethren students at Ohio State. He is also a member of the extension professors association of which he is a past president.

His professional record reveals that Professor Overholt has in the past served as member of the Ohio governor's committee on water resources, and of a committee on drainage legislation and water rights of the Ohio Farm Bureau Federation.

Few of the millions of people who travel the Ohio Turnpike realize the special planning which went into its design to minimize interference with present and future farm drainage for miles on both sides of the pavement. That planning, which avoided millions of dollars in damage claims, was due largely to the foresight of Virgil Overholt.

Virgil Overholt and his wife, the former Dora E. Hattery, have two children, a son, David P., and a daughter, Clara Catherine (Whitehouse). The Overholts have six grandchildren ranging in age from seven to fifteen years, all of whom, according to their grandfather, have discovered him to be a rather easy touch.

Mr. and Mrs. Overholt are members of the First Avenue Evangelical United Brethren Church in Columbus, of which Virgil is at present chairman of the board of trustees and a teacher in the Sunday School.

Virgil is also a member of Alpha Zeta fraternity and of the University Lodge and York Council, Free and Accepted Masons, in Columbus. His hobbies include hunting, fishing, archery, gardening and history, which he says provide him with so many interesting things to do that time never hangs heavy on his hands.

One hobby that has absorbed much of his time and interest has been compiling the early history of the Overholt family. His ancestors were some of the very first Mennonite settlers early in the 18th century.

Some years ago Virgil Overholt all of a sudden and quite unexpectedly, found himself exposed to the glare of nationwide limelight. It all happened as a result of his decision to join thousands of other hunters on a day in November 1953 which opened the pheasant hunting season. Virgil set forth with his trusty gun and high hopes of bagging a bird — but here is how an Associated Press dispatch dated November 25 tersely relates what happened; captioned "Professor Snares Pheasant Handily," it reads: "Professor Virgil Overholt was so startled when a pheasant came straight at him that he dropped his gun. But the Ohio State University professor had the presence of mind to grab at the bird's tail as it went by. Result: one pheasant bagged, no shots fired."

What actually occurred, relates a former associate, was that the bird had been shot by another hunter and just happened to fall at Virgil's feet. The interesting part of the story was that he received many letters (most of them replete with kidding overtones) from friends and relatives he had not heard from in many years.

The selection of Virgil Overholt as the recipient of the John Deere Medal for 1961 will be widely acclaimed by former students, professional associates, farmers — indeed by all to whom this man's service as an agricultural engineer is known and appreciated. Of him too it may rightly be said: "Well done, thou good and faithful servant."

JAMES S. BOYD

(Continued from page 367)

supervised four Ph.D. degree candidates and several M.S. degree students. All of these men are now holding responsible positions; in fact, one of them is chairman of an agricultural engineering department.

A conspicuous example of a coordinated research and extension program for which Dr. Boyd has been responsible, is the study of dairy housing over the past ten years. This is a broad program of loose housing for dairy cattle and includes pioneer studies of metal buildings for animal shelters, pole structures, four-stall walk-through milking parlors, movable self-feeding hay bunks, self-feeding upright silos, mechanization of forage handling, clear-span building construction with wood trusses, and functional planning.

Along with these studies, the farm structures extension program at Michigan State University has placed major emphasis on disseminating findings on this broad project, the objective being to make Michigan's dairy industry efficient, competitive and profitable for dairymen. The program has resulted in broad acceptance of the loose-housing system, clear-span pole buildings, walk-through milking parlors, self-feeding of hay, and the mechanical handling of silage from large-diameter, upright silos.

Dr. Boyd has been notably successful in developing a highly qualified group of specialists that work together as a team. The group has carried out a balanced program of basic and applied research, publications, college teaching, and extension education as a means of disseminating the results of their work to both farmers and industry in Michigan and elsewhere. The success of this program, as Dr. Boyd and his associates make clear, has been highlighted by the cooperation and direct support of several interested commercial organizations.

One former associate comments further: "Dr. Boyd has authored many extension circulars; in fact, the excellent MSU farm building plan service is largely the result of his work."

An active program of cooperation with building equipment and materials trade associations has always been an important consideration in Jim Boyd's plans for his farm structures section. He regularly attends meetings of the various associations of materials and equipment manufacturers and dealers, which provide him opportunity to stress continually the importance of high-quality materials and construction and to keep industry abreast of ever-changing farm needs.

A onetime member of the Michigan State staff says that the MSU extension program in farm structures is the envy of the country. Two full-time specialists, with part-time help of research and teaching personnel, have taken this animal production program out into the state. Training schools have been held for county agricultural agents and farm building contractors. More than thirty-five contractors affiliated with the Michigan Farm Bureau are now participating in a certified program that uses the plans of the MSU-designed clear span system. More than 5,000 sets of these plans are distributed each year.

As a result of Jim Boyd's unique relation with trade associations, he has assisted in training their field men in the principles of good functional design, with the result that each component of a system built on the farm is functionally located and fits the over-all plan. This means that good planning is sold along with the product, and the final objective of an efficient livestock-production facility is achieved.

James S. Boyd became a member of the American Society of Agricultural Engineers in 1940 and has since participated actively in Society affairs. Several of his technical papers presented at meetings of the Society and later printed in its publications have received top rating. He has served as chairman of the Committee on Farm Fence Construction Standards, and as a member of other committees. He has been an active worker in the Michigan Section of ASAE, having served two terms as vice-chairman and a term as secretary.

Dr. Boyd is also a member of the Michigan Academy of Arts and Sciences, Gamma Sigma Delta, Sigma Xi, Naval Research Reserve, and the American Society for Engineering Education.

Jim Boyd and his wife, the former Virginia Paul, have three children: two daughters, Theresa and Sandra, and a son, Edwin. The Boyd family is active in the University Lutheran Church in East Lansing, of which they are members. Jim is chairman of the property committee and a past chairman and treasurer of the men's club of the church.

Jim says that music comes as close to being a family hobby as anything. He plays the piano and leads singing for the Kiwanis Club; also he and elder daughter, Theresa, sing in the church choir. Younger daughter, Sandra, and son, Edwin, sing in the junior choir, and play the piano and Virginia tries to get them all to practice.

The Boyds have a cottage on one of Michigan's beautiful lakes about 100 miles north of East Lansing, which the family thoroughly enjoys. It has been appropriately named "The Boyd's Nest."

In reviewing the course of Jim Boyd's professional career as an agricultural engineer over the years, one is impressed with its steady, praiseworthy progress from the start. A typical example is the rapid acceptance of the broad program which he initiated in his farm structures section at Michigan State University. This has been responsible in large measure for the rapid change from the familiar image of the Michigan farmstead with its red gabled barn. The single-story barn with milking parlor used in the loose-housing system is rapidly coming into use, and it is largely due to Dr. Boyd's experience and leadership that this new concept of livestock management is gaining wide acceptance.

. . . Agriculture, Engineering and You

(Continued from page 347)

tors! Many of you will be expected to do some real brain-flexing on this job.

Work has hardly started on the massive problem of modifying the topography of farm and ranch land and developing water resources so as to improve the over-all mechanical efficiency of crop production. The task of conserving water and governing the rate of water movement within watersheds demands much enlarged agricultural engineering research and development programs. Better man-made environment is needed in order to control the quantity, quality and cost of crop production. And, farmers are expecting agricultural engineers to develop the means for gaining this at a price they can afford to pay. We should "open up the throttle" and move ahead rapidly in this area.

The sun should be put to work more efficiently! It is time to start treating plants for what they are — the best means now available for transforming solar energy into useful forms. The "solar-energy" approach to farm production illustrates the need for learning much more about the physical laws which govern plants and animals. This approach requires new methods for appraising each step of the conversion process in terms of energy input and energy stored. This is an area of complex science that certainly demands both depth of knowledge and versatility.

The largest number and the widest variety of new opportunities exist in the relatively new area of handling, processing and distributing agricultural commodities. The food and fiber processing business now has a dollar value almost twice as large as farming and it's still growing! Housewives want giant strides made toward a wider variety of products and more built-in conveniences. Let's get to work fast in this area.

I think that you will agree that a wide variety of opportunities and important challenges for agricultural engineers *does* exist throughout industry. And, they do require versatility. So, in the light of changing patterns and changing technology, now is the time for more action, by you, in helping our dynamic programs advance rapidly. We *must* advance rapidly in order to develop our professional growth and leadership prospects — *this is our major job.*

Now, consider a few other things you can do to help make professional progress. The main "vehicle" for making progress is the American Society of Agricultural Engineers. And, *you* are one of the propelling forces for this "vehicle". Its main job is putting learned papers, technical publications, and other knowledge, technology and services into useful form. Your full support is needed to make it possible to carry on this job rapidly and efficiently.

You can accept an important role in at least one part of the total educational function which subdivides naturally into four parts. First, the publishing of learned research papers. Second, the abstracting of scientific and technical knowledge from related areas of interest. Third, the publishing of proceedings of seminars and other meetings for logical interpretation and suggested applications of technological facts. And, fourth, general news about the profession and new technical progress.

Our educational functions demand action now — and you can help get the ball rolling for your own good! With a vast amount of scientific and technical literature already in circulation, the "ball" is a huge one. During the past twenty years the growth of research and development work has been astounding. About half as much money was spent for research and development in the past ten years as was spent during the preceding two hunderd years! This increased research effort has provided the basis for thousands of books and serials. And, science now accounts for more than fifty-five thousand current periodicals.

It's up to each of you to help select the articles and abstracts published in our technical journals so as to insure that only the *work of lasting value* is preserved. The same kind of discriminating coverage must be extended to include basic work reported in foreign publications and references to learned papers in other areas of science and technology. So, it's imperative that we have publication policies which will emphasize the *really new* information and present it in direct, concise, and usable form. The task of formulating new policies for your consideration has been assigned to a new committee on Publication Policies and Finances.

In brief, our Society publications should report three things: (1) *What has been done,* (2) *what is being done,* and (3) *what is being planned in relation to agricultural engineering.* This is an essential service if our researchers in industry and public service are to develop timely and fruitful programs free from overlapping objectives and goals. Since the employers of agricultural engineers are joint benefiters of a clearing house service, *they* must be convinced that a good educational service is worthy of their support. This move should be accompanied by a plan for getting all of the engineers employed in the entire agricultural industry to participate actively in the American Society of Agricultural Engineers. There are many ways for you to help on these jobs.

The many tasks performed by the headquarters staff of our Society are steadily getting larger. Active members drawn from an active industry characteristically have active wants and needs. The more you want from your Society the more it is worth to you. The more you contribute to your Society the more you can benefit from it. Small wants and small contributions may indicate small progress. You should seek a job in ASAE — not wait to be assigned one. And, National and Sectional officers should see that a job is available for every progressive member.

These thoughts about some inter-relationships between "agriculture, engineering and you" can be of value only if they stimulate some new and more imaginative thinking on your part — thinking about new routes into what appears to be the bright future for agricultural engineering. As you know, two requisites for charting new routes are an up-to-date map and a willingness to abandon the old routes we already know so well! Two risks along any route we select, are the possibility of becoming beached on the shifting sands of time; and, becoming swamped in the swelling tides of technical progress. It's your job to help chart new routes in deeper water and to help provide the kind of "vehicle" needed to move more "cargo" at a higher speed.

Thanks to each of you for granting me the privilege and pleasure of serving as your helmsman for one year. This experience has added to my pride in Agricultural Engineering.

This I have learned from visits to your Section meetings:

— there *is* more *agriculture*
— there *is* more *engineering in it*
— there are *greater opportunities* in it *for you*

So, the progress formula is simple after all — more agriculture, more engineering *and an active you!*

Companies Plan to Hire 6% More 1961 Engineering Graduates

According to a recent Northwestern University survey, 210 medium-to-large companies, in the face of uncertain business conditions, report they will seek 5.9 percent more 1961 engineering graduates, but 3.2 percent fewer non-technical graduates than they did in 1960. The over-all demand for 1961 graduates averages out to a "no change" from last year. The survey, conducted by Frank S. Endicott, director of placement at Northwestern, is the 15th annual edition entitled "Trends in Employment of College and University Graduates in Business and Industry." Although reporting companies expect to pay only \$520 per month for engineers compared with an average starting salary of \$510 for 1960 graduates, the report notes that, "Experience has shown . . . that competition for the so-called 'top men' tends to force starting rates upward later in the interviewing season, especially for engineers and other technically trained men."

The following chart compares present monthly earnings for various classifications of college graduates since 1950:

Present Monthly Salaries of Graduating Classes

	Class of 1961[1]	Class of 1960[2]	Class of 1955	Class of 1950
Engineering	\$520	\$555	\$682	\$849
Accounting	458	490	629	810
Sales	451	490	667	820
General Business	439	470	620	799

[1]estimated [2]estimated as of June 1961

As can be noted, a significant finding in this new survey is that engineering graduates, who formerly were found to lose their salary advantage over other groups after five to ten years, now appear to be keeping their salary lead.

Adopts New Curriculum Policy

A new policy relating to ASAE recognition of curriculum, recently has been advanced by the ASAE Committee on Curriculum and Course Content, supported by the Education and Research Division Steering Committee, and adopted by the ASAE Council. The new policy affects every agricultural engineering department already recognized by ASAE as well as those which will seek recognition in the future. The new policy is as follows:

"A. Agricultural engineering departments accredited by ECPD will be listed as having recognized curriculums of ASAE and designated as ECPD approved.

"B. Other departments offering curriculums which have been recognized by ASAE within five years prior to January 1, 1964, will be listed as having recognized curricula in the Society's records published during the calendar year 1964. Thereafter, no departments will be considered to have a recognized curriculum unless its curriculum has either (1) been accredited by ECPD within the preceding five-year period or (2) has been recognized by ASAE within the same five-year period."

In making the resolution the Steering Committee of the Education and Research Division stated that this statement of policy does not imply unconditional endorsement of ECPD-inspected and approved departments. ASAE considers it a responsibility of the Society to establish requirements for approval. For the immediate future, those curricula having ECPD-accredited status are considered as recognized by ASAE. Also, it recommended that curricula anticipating recognition by ASAE start proceedings well in advance of the 1964 deadline so as not to place an unnecessary handicap on the committee at the last minute.

International Horticultural Congress in 1962

The XVIth International Horticultural Congress will be held August 31 to September 8, 1962, in Brussels, Belgium. The Organizing Committee for the 1962 Congress decided on Brussels in order to stress its association with the First International Horticultural Congress, also held in Brussels in 1864. Therefore, since the interval between congresses is three or four years, the date set for but 20 months ahead of the actual date will make it possible to celebrate the centenary of the International Horticultural Congress in the very town where it originated. The secretary for the Congress is located at the State Agricultural College, Coupure Links, 235, Ghent, Belgium, where information may be obtained.

PE Registration Changes

The National Council of State Boards of Engineering Examiners has announced that because of a large number of revisions in the state laws since 1958, the "Synopsis of State Engineering Registration Laws and Policies and Procedures of State Boards" has been revised. The revised synopsis was compiled by the Committee on Uniform Laws and Procedures and copies are available at $10.00 each from the NCSBEE office, in the Civil Engineering Building, Room 216, Clemson, S. C. Revised copies of the "Digest of Court Decisions" are available also at $10.00 each. Copies of the synopsis and digest ordered together may be obtained for $15.00.

Conference on Insulation for Electrically Heated and Cooled Houses

A conference on insulation for electrically heated and cooled houses, held on June 1 and 2 at the National Housing Center in Washington, D.C., was well received by the 106 in attendance. The conference was sponsored jointly by the ASAE Electric Utilization Research Committee and the USDA Agricultural Research Service. The purpose of the conference was to develop and disseminate the most current information on technical and economic factors affecting the design and installation of insulation in electrically heated and/or cooled houses.

The sponsors' welcome to the two-day conference was given by E. G. McKibben, director, Agricultural Engineering Research Division, ARS, USDA, and W. J. Ridout, Jr., chairman of the ASAE Electric Utilization Research Committee. The keynote address, entitled "What Makes Electric House Heating Practical," was given by R. L. Boyd. Participating in the June 1 morning session were F. H. Sides, who gave a presentation on insulation — past and present; and G. A. Erickson, who talked on the field laboratory for heating studies. The afternoon session included papers on moisture in houses and its control, by L. O. Anderson; paint as a vapor barrier, by Francis Scofield; infiltration measurements in a test bungalow under controlled conditions and in ten electrically-heated residences, by C. W. Coblentz; and heating and cooling loads and calculations, by E. J. Brown. During the June 2 forenoon session, papers were presented by M. W. Smithman on the economics of insulation; L. O. Anderson on current design considerations and installation methods for insulation; and R. L. Checkel on foamed-in-place insulation. Discussions after each session were led by M. H. Wessel on June 1 and by F. H. Sides on June 2. The conference closed with remarks by N. C. Teter.

Copies of the Proceedings of the Conference will be available from the American Society of Agricultural Engineers, 420 Main St., St. Joseph, Mich.

ASEE Membership Reaches 10,000

The American Society for Engineering Education has for the first time in its history achieved a membership of 10,000. Donald R. Brutvan, professor of chemical engineering at the University of Buffalo, is the 10,000th member of the Society. Mr. Brutvan has just re-entered the teaching profession and was very happy to learn that he has the distinction of becoming the 10,000th member of the Society. ASEE was founded in 1893, at the World's Fair in Chicago. Its membership has steadily grown from its founding size of 70, and today's members are from schools, colleges, universities, research laboratories, industry, and government in the United States and at least 46 foreign countries. It is the only professional society established solely to study and improve education in its field. Its growth corresponds directly with the growth of engineering faculties in colleges and universities throughout the United States. After World War II, ASEE served as the pattern for establishing the Japanese Society for Engineering Education, and last year for the formation of the Association of Brazilian Professors of Engineering. Also patterned after ASEE is the recently established Indian Society for Engineering Education.

Western Resources Conference

The third annual Western Resources Conference will be held August 7 to 11 on the campus of Colorado State University, Fort Collins. The conference is sponsored jointly by CSU, the University of Colorado and the Colorado School of Mines. Under the conference theme of "Land and Water: Planning for Economic Growth" discussion sessions will be conducted on many phases of national, regional, and state planning for the best use of the nation's resources. A number of field trips, including an inspection of CSU's hydraulics research facility, have been scheduled.

EVENTS CALENDAR

July 19-20 — *National Farm Fire Safety Seminar,* Thor Research Center for Better Farm Living, Huntley, Ill. Write to Thor Power Tool Co. for information.

July 23-29 — *National Farm Safety Week.*

July 30-August 2 — *16th Annual Meeting, Soil Conservation Society of America,* Purdue University, West Lafayette, Ind. Further information may be obtained from SCSA headquarters, 838 Fifth Ave., Des Moines, Iowa.

August 1 – September 12 — *International Course on Irrigation, Subtropical Regions,* Irrigation Extension Centre of the Ministry of Agriculture, Ruppin Institute of Agriculture, Emek-Hefer, Israel. Information may be obtained by writing to J. Noy, director, Ministry of Agriculture, Irrigation Extension Center, Post Hamidrasha, Le'Haklaut, Emek-Hefer, Israel.

August 7-11 — *Third Annual Western Resources Conference,* Colorado State University, Fort Collins. Information may be obtained from Colorado State University.

August 14-17 — *50th Anniversary Meeting, International Association of Milk and Food Sanitarians,* Hotel Savery, Des Moines, Iowa. For information contact T. L. Jones, Room 512, 1145 19th St., N.W., Washington 6, D.C.

August 28 - September 1 — *ASME International Heat Transfer Conference,* University of Colorado, Boulder. Write to American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y., for information.

September 4-10 — *International Commission of Agricultural Engineering (CIGR), First and Second Sections Work Meetings,* Rome and Sardinia, Italy. Write to CIGR, Paris, France, for details.

September 5 - 8 — *11th National Chemical Exposition,* sponsored by the Chicago Section, American Chemical Society, International Amphitheatre, Chicago, Ill. Further information may be obtained from The Chicago Section of the American Chemical Society, 86 E. Randolph St., Chicago 1, Ill.

September 6-8 — *Seventh Midwest Conference of Fluid Mechanics and Solid Mechanics,* Kellogg Center for Continuing Education, Michigan State University, East Lansing. Address inquiries concerning the conference to: Conference Publicity Committee, c/o J. E. Lay, Department of Mechanical Engineering, MSU, East Lansing, Mich.

September 9-24 — *42nd National Fair,* Comptoir Suisse, Lausanne, Switzerland. Obtain information from the Fair Administrative Offices, Comptoir Suisse, Palais de Beaulieu, Lausanne, Switzerland.


L. H. Skromme


F. C. Fenton


D. A. Milligan


W. T. Mills

Lawrence H. Skromme, past-president of ASAE, has been named vice-president for engineering of New Holland Machine Co., farm machinery division of Sperry Rand Corp. He joined New Holland in 1951 as chief engineer. Previously he served as draftsman, designer, and test engineer of farm tractor and implement tires for Goodyear Tire and Rubber Co. He also was associated with Harry Ferguson, Inc., as project engineer and assistant engineer of farm tractors and implements. Although his term of office as a member of the ASAE Board of Directors expired during the Annual Meeting in June, he will serve as an ASAE representative to the International Commission of Agricultural Engineering. He is a member of the American Society for Engineering Education, Society of Automotive Engineers, American Association for Advancement of Science, and Ordnance Association; serves on the Advisory Engineering Committee for the Farm Equipment Institute; and is an alternate director of the Engineers Joint Council.

F. C. Fenton, Life Fellow and past-president of ASAE, has announced his retirement as professor of agricultural engineering at Kansas State University, after 31 years of service. He was born in 1891 near Waterloo, Iowa, and received a B.S. degree in agricultural engineering from Iowa State University in 1914. He also received an M.S. degree in agricultural engineering from ISU, as well as attending Oxford University in England. Before World War I, he did agricultural extension work in Iowa, and at the University of Missouri where he supervised construction of the first terraces in the state for soil erosion control. After serving in the Army during World War I, he returned to Iowa State University in 1919 as associate professor in farm structures. He served in this position until 1928 when he accepted the position of head of the agricultural department at Kansas State University. In 1956 he retired from this position and accepted a two-year assignment with the International Cooperation Administration in New Delhi, India. During this period he supervised the work of five American technicians in irrigation, grain storage, and farm machinery training.

His professional and honorary memberships include Sigma Xi, Gamma Sigma Delta, Alpha Zeta, Phi Kappa Phi, Delta Sigma Rho, Sigma Tau, Kansas Engineering Society, and the American Society for Engineering Education.

David A. Milligan has been appointed to the new post of general manager, marketing and product development at J. I. Case Co. He formerly was vice-president of the company's industrial division.

William T. Mills, formerly assistant professor of agricultural engineering at North Carolina State College, has joined Lilliston Implement Co. as research analyst. His project is to determine from present knowledge, plus application of imagination and logic, the system that will result in the highest quality peanuts consistent with the lowest cost per unit of producion.

Bud S. Moss has been promoted from division sales supervisor in the Columbus office of Georgia Power Co. to manager of the company's merchandise division at the general office in Atlanta.

Glenn I. Johnson, professor of agricultural engineering, University of Georgia, is in Phnom-Penh, Cambodia, with the Georgia Contract team, helping to set up an educational system for that country.

R. R. Harris, assistant professor of agricultural engineering, University of Georgia, has been elected vice-president of the Southern Association of Agricultural Engineering and Vocational Agriculture.

Theodore M. Zorich, a Colorado State University agricultural engineering senior, who was partially paralyzed five years ago by a severe attack of polio, has been named "Honor Engineer," highest CSU engineering award given and sponsored by the Colorado Engineers Council. In addition to maintaining better than a 3.0 ("B") average, he has been president of the Colorado student branch of the American Society of Agricultural Engineers, a member of Sigma Tau engineering society, and was the 1959 winner of the Edward B. House engineering scholarship, awarded to a student with an interest and aptitude for engineering teaching. As a senior he was listed in the collegiate edition of "Who's Who," and he won the Ralph L. Parshall Award, presented each year by the Fort Collins Engineers Club to an outstanding senior engineer interested in water resources and irrigation engineering.

Presently his plans include study towards an M.S. degree at CSU and entrance into the teaching field, which he feels he would enjoy and be able to handle. His graduate study will be in fluid mechanics. He is married and has three children.

Zorich is the fourth agricultural engineer to win the Colorado Engineers Council award as top man in the senior class in the Engineering College in seven years.

Willard H. Tanke, chief engineer, LaCrosse Works, Allis-Chalmers Mfg. Co., has received the Allis-Chalmers "Science and Engineering Award" consisting of a silver "Medallion of Eminence," a certificate and $5,000. It recognizes his invention of the "zero pressure" rubber tire designed to provide automatic self-cleaning and a practical method of accurately gauging the depth of ground working tools. The tire's design called upon flexing action in rolling over the ground to shed dirt and to flex over small stones and similar obstacles without raising the ground working tools above their depth setting.

(Above) **Theodore M. Zorich** *(left)*, **Colorado State University agricultural engineering senior, and N. A. Evans, head of CSU agricultural engineering department, discuss an apparatus used for training in water hydraulics laboratory. Zorich, despite being partially paralyzed by polio, has maintained better than a "B" average and won several engineering honors, including "Honor Engineer", highest CSU engineering award**

(Below) **Willard H. Tanke** *(left)*, **chief engineer, LaCrosse Works, Allis-Chalmers Mfg. Co., has received the Allis-Chalmers Science and Engineering Award in recognition of his invention of the "zero pressure" rubber tire.** *(Left to right)* **The recipient and Mrs. Tanke display the silver "Medallion of Eminence" and certificate for company officials, R. S. Stevenson (president), A. W. Van Hercke (vice-president), and L. W. Davis (vice-president)**

C. W. Hall

C. E. Worlan

Carl W. Hall, professor of agricultural engineering, Michigan State University, is on a two-month leave of absence (July and August), to help the Government of India establish a training and research program in dairy engineering. The program is a part of the Ohio State University and U.S. Technical Cooperation Mission (TCM) to India. His assignment is to develop a one-year dairy engineering curriculum at the National Dairy Research Institute at Karnal, Punjab, India. He also will develop dairy engineering courses for a four-year course in dairy technology at the Rajasthan College of Agriculture, Udaipur, India. In addition, he has been asked to analyze the dairy plant operation at Karnal and Udaipur and give recommendations for their improvement.

Carroll E. Worlan has been named retail merchandising manager and utilities coordinator for *Better Homes & Gardens* magazine. In his new position his responsibilities will include the Better Homes & Gardens Idea Center program, the Idea Home program, as well as working with the Edison Electric Institute, the American Gas Association, and a number of other business and trade associations. He previously was assistant executive secretary of the Iowa Utilities Association and manager of the area development program for Iowa Power and Light Co. in Des Moines.

Gene T. Thompson has accepted a position with International Cooperation Administration and is located in Amman, Jordan. Previously he was a county extension agent, an agricultural engineer with the U.S. Bureau of Reclamation, and a consulting agricultural engineer with the Arabian American Oil Co.

Harold A. Kramer, agricultural engineer (research), Market Quality Research Division, USDA, Beltsville, Md., received a Superior Service Award at the USDA Honor Awards ceremony held at the Washington Monument grounds, Washington, D.C., on May 23, 1961. The Department annually gives public recognition by appropriate ceremonies and suitable awards to exceptional employees who, through their achievement and work, have rendered outstanding service to the public. Mr. Kramer received a silver medal and a certificate, which were presented by Secretary of Agriculture Orville L. Freeman.

Billy W. Powell has accepted the position of field service engineer on the Atlas Missile program of General Dynamics Astronautics. He formerly was with Boeing Airplane Co. as a field service engineer.

Elmer W. Smith has been transferred from the Warm Springs Agency of the Bureau of Indian Affairs, Warm Springs, Ore., to the Umatilla Agency, Pendleton, Ore.

George E. Webster has accepted the position of farm director with television and radio station WFIL, Philadelphia, Pa. He previously was head of the agricultural engineering department at National Agricultural College in Fountainville, Pa.

Carl V. Chumney has accepted the position of instructor of agricultural engineering at Tarleton State College, Stephenville, Texas. He previously was associated with The Lutcher & Moore Lumber Co.

David F. Nolte, formerly a programming assistant with the USDA Soil Conservation Service, has accepted the position of agricultural engineer with Stoddard and Karrer, Consultants, in Los Banos, Calif.

Charles F. Wilson, previously with International Paper Co., is now affiliated with the Department of the Interior, Bureau of Indian Affairs in Sells, Ariz.

Woodrow W. Hare has accepted a position with the Coastal Plain Experiment Station at Tifton, Ga. He previously held the position of field representative with American Zinc Institute.

R. E. Hunt, formerly assistant general manager of the Tractor and Implement Division, Ford Motor Co., has been appointed general manufacturing manager with responsibility for manufacturing planning.

Pacific Coast Section

A record attendance of over 130 people turned out for the Pacific Coast Section's annual meeting at the University of California, Davis, on March 30 and 31. One of the highlights of the two-day meeting was the address given by ASAE President L. W. Hurlbut, entitled "A New Look at Agricultural Industry and the Role of the Agricultural Engineer in It." In addition to the excellent technical papers, those attending were stimulated by a very well-done panel discussion on the engineering and social implication of the present farm labor situation. The following new slate of Section officers for the year 1961-62 were introduced and assumed their duties; W. J. Adams, Jr., chairman; R. C. Reeve, vice-chairman; R. G. Curley, secretary-treasurer; K. K. Barnes, elected member; and M. V. Johnson, Jr., past-chairman.

The Section has planned the following schedule for publication of its "Newsletter" — the Fall issue about October 1, the Winter issue about February 15, and the Spring issue about May 1.

The Section has accepted an invitation to join the Board of Sponsors of the Western Space Age Industries and Engineering Exposition to be held in San Francisco in April 1962. The purpose of the Exposition is to stimulate and bring together the leading production industries of the west and the firms and organizations (including the various departments of the federal government for whom they produce) for an interchange of knowledge and understanding and to open the gate of any business opportunities.

Southeast Section

R. K. Smith, secretary-treasurer of the Southeast Section, requests that suggestions for the Section meeting program in Jacksonville, Fla., be sent to him addressed as follows: R. K. Smith, Extension Rural Electrification Specialist, P.O. Box 1535, State College, Miss., by August 1. He also requests that suggestions please include a speaker and a topic.

Florida Section

Thirty-five members attended the Florida Section annual meeting held May 18 to 20 at the Daytona Plaza Hotel, Daytona Beach, Fla. Again this year the Section awarded

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(Left) President L. W. Hurlbut addressed the annual meeting of the Pacific Coast Section held at the University of California, Davis, on March 30 and 31. His subject was A "New Look at Agricultural Industry and the Role of the Agricultural Engineer in It" (Right) Pacific Coast Section officers for 1961-62 assumed their duties at the Section's annual meeting in March. Left to right are: M. V. Johnson, Jr., past-chairman; W. J. Adams, Jr., chairman; R. C. Reeve, vice-chairman; and R. G. Curley, secretary-treasurer

54th Annual Meeting

Held at Iowa State University June 25 to 28

(Left) In behalf of Secretary of Agriculture Orville L. Freeman, who was unable to attend, Frank J. Welch, Assistant Secretary of Agriculture addressed the General Session Tuesday morning

Byron T. Virtue *(left)*, consultant, Bearings Division, The Torrington Co., accepts the gavel from retiring President L. W. Hurlbut, chairman, agricultural engineering department, University of Nebraska, during the inauguration ceremonies for the new president, held Wednesday evening

AN all-time attendance record was set during the 54th Annual Meeting of ASAE held on the campus of Iowa State University, June 25 to 28, 1961. A total of 1547 registered, which included 1001 male registrants, 274 women, and 272 children. In addition, 41 members of the press were in attendance. According to reports, registrants attended from all of the 50 states and from Canada, Japan, Holland, Australia, Russia, India, and Romania. Spurred on by the realization that an attendance record was almost to be broken, enthusiasm seemed to be at an all-time high and was matched by an outstanding performance in the handling of all events and activities. High praise was expressed by ASAE members to those who were responsible for conducting the many details associated with the meeting. Compliments were frequently heard concerning the excellent local arrangements under the chairmanship of Henry Giese, Leon F. Charity, Meeting Committee chairman, Hobart Beresford, head, agricultural engineering department, and staff members of the agricultural engineering department and cooperating USDA engineers (and wives), who were responsible for the many successful committee assignments and deserve all the commendations extended them. The Board of Directors of ASAE adopted a resolution of appreciation to Iowa State University, to the Iowa Section of ASAE, and to members of the host committees for a truly outstanding meeting.

Technical Program

The technical program opened on Monday morning with five concurrent sessions for the following divisions: Power and Machinery (Programs A and B); Soil and Water; Electric Power and Processing; and Farm Structures. Monday afternoon sessions included the following divisional programs: Joint Farm Structures and Electric Power and Processing; Power and Machinery (Programs A and B); and Soil and Water (Irrigation and Hydrology Groups).

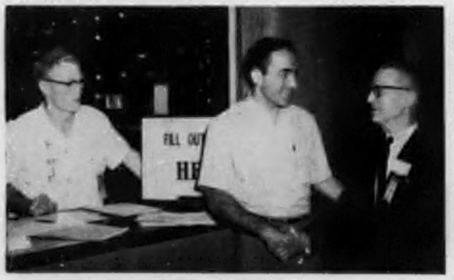
Concurrent sessions continued on Tuesday afternoon when the Electric Power and Processing and Power and Machinery Divisions each held two sessions, and the Farm Structures Division held one. The Public Lands and Public Works Group also held a Tuesday afternoon session, as well as a joint meeting with the Soil and Water Division.

The technical program concluded on Wednesday morning with six concurrent sessions for the following: Joint Soil and Water and Public Lands and Public Works; Electric Power and Processing; Farm Structures; Power and Machinery (Programs A and B); and Education and Research.

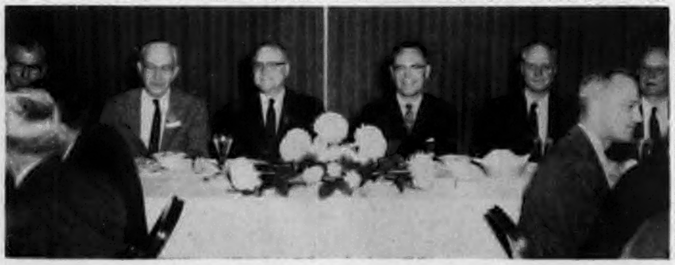
Frank H. Hamlin, president, Papec Machine Co., addressed the General Session Tuesday morning on the subject "Partners"

Extension Program

More than 60 agricultural engineers attended the Extension Program held on Monday morning as a breakfast meeting to hear discussions on the "whys" and "wherefores" of publications serving agricultural engineers. Kirk Fox, editor emeritus, *Successful Farming,* was the featured speaker on the subject, "What Makes a Publication Good?"



E. Paul Taiganides *(center)*, Iowa State University graduate student from Beria, Greece, is being congratulated as the 1000th registrant by Henry Giese, chairman of local arrangements. Shown at left is Robert A. Saul, who completed the registration



A special ASAE Board of Directors luncheon was held in honor of Assistant Secretary of Agriculture Frank J. Welch following his address on Tuesday. Left to right are M. S. Coover, dean emeritus of engineering, Iowa State University; Byron T. Virtue, incoming president of ASAE; Secretary Welch; L. W. Hurlbut, outgoing president of ASAE; J. H. Jensen, Iowa State University Provost; and A. W. Farrall, newly-elected president-elect of ASAE. In foreground is Leon F. Charity, Meetings Committee chairman

AWARD WINNERS

1961 ASAE award winners include J. R. Orelind *(left)* recipient of the Cyrus Hall McCormick Medal; Virgil Overholt *(center)* recipient of the John Deere Medal; and James S. Boyd *(right)* recipient of the Metal Building Manufacturers Association Award. Retiring President L. W. Hurlbut made formal presentations of the awards during the Wednesday evening banquet. Further details will be found on pages 366 and 367

Business Meeting and General Session

The annual business meeting preceded the General Session on Tuesday morning at which time the winning student paper entitled "Cantilever Construction in Farm Sheds" was presented by John P. Cannon of Utah State University. L. F. Charity, chairman of the Meetings Committee, presided at the General Session, and L. W. Hurlbut opened the session with his president's address entitled "Agriculture, Engineering and You." See page 347 of this issue for complete address. In behalf of Secretary of Agriculture Orville L. Freeman, who was unable to attend, Frank J. Welch, Assistant Secretary of Agriculture, addressed the General Session. His topic was "New Frontiers." Frank H. Hamlin, president, Papec Machine Co., also addressed this session, his subject being "Partners."

Special Activities

The special activities during the 54th Annual Meeting began on Sunday evening with a buffet dinner and entertainment. A special attraction on Monday evening was a chicken barbecue, followed by square dancing. The annual FEI dinner for students was held Tuesday evening. Special ladies' and children's programs were enjoyed, as well as organized tours. On Wednesday afternoon off-campus tours included the Engineered Livestock Production Facilities; John Deere Des Moines Works; Terrace Construction; and National Animal Disease Laboratory. On-campus tours were made to the Engineering Group Inspection and the Institute for Atomic Research. A special tour of the Meredith Publishing Co. also was made on Wednesday afternoon and a Western Iowa Watersheds tour was made on Thursday.

Student Activities

The following officers were elected to serve on the National Council of ASAE Student Branches for 1961-62: President, Ronald Licht (University of Nebraska); first vice-president, David Clements (University of Georgia); second vice-president, Norman Arends (Colorado State University); and secretary, Alvin Bailey (Michigan State University). ASAE President L. W. Hurlbut was the featured speaker at the Monday morning student breakfast program. His address was followed by the presentation of winning papers in the ASAE Student Paper Award competition. First

(Continued on page 383)

(Below) J. L. Butt, executive secretary of ASAE, and Hobart Beresford, head, agricultural engineering department, Iowa State University, welcome a Japanese delegation of high-ranking government and industrial officials to the meeting. Standing *(left to right)* are: Takuechi, interpreter; Y. Hayashi, director, Agricultural Experimental Station, Gific Prefectural Government; G. K. Rule, group leader, for the touring Japanese representatives, T. Hayashi, chief, technical division, and executive director, Toyohira Farm Machinery Mfg. Co., Ltd.; H. Kusano, interpreter; U. Tetsuka, chief, second laboratory, Farm Machinery Section, Ministry of Agriculture and Forestry; Beresford; M. Imoto, chief, technical section, Manufacturing Division, Tokyo Plant, Fujii Manufacturing Co., Ltd.; and Butt. Seated *(left to right)* are: K. Fukumoto, assistant chief, sales division, Mitsubishi Chemical Industries, Ltd.; S. Imamura, chief, agricultural administrative section, Agricultural Affairs Division, Tochigi Prefectural Government; G. Kanazawa, chief, promotion division, Electric Chemical Industry Co., Ltd.; K. Kurokawa, chief, technical extension section, Fertilizer Division, National Federation of Purchasing, Agricultural Cooperative Association

(Below) (Top) Officers for the National Council of Student Branches elected on the final morning of the meeting are as follows: *(Left to right)* Norman Arends, Colorado State University, second vice-president; Alvin Bailey, Michigan State University, secretary; Ronald Licht, University of Nebraska, president; David Clements, University of Georgia, 1st vice-president. (Bottom) Winners of the FEI Trophy Awards during the FEI Student Dinner are as follows: *(Left to right)* Lee Ott, University of Nebraska, 3rd place Class B winner; Norman Arends, Colorado State University, 2nd place Class B winner; Russ Johnson, University of Missouri, 1st place Class B winner; David Clements, University of Georgia, 1st place Class A winner; Rollin Strohman, University of Illinois, 2nd place Class A winner; and Dan Gebhart, Ohio State University, 3rd place Class A winner

. . . With ASAE Sections

(Continued from page 373)

plaques for outstanding service to agricultural engineering in Florida. W. R. "Buster" Hancock received the award for, among other things, his work in establishing a modern agricultural building at the University of Florida. The Florida Power Corp. was awarded a plaque for cooperation with youth and rural groups in Florida in areas in which agricultural engineers have a primary interest and the backing of farm electrification research at the University of Florida. The plaque was accepted by W. J. Clapp, president of Florida Power Corp. Harris, Wood & Associates of Stuart was cited as the first engineering firm in the state comprised of agricultural engineers devoting full time to rendering professional engineering service to the industry of agriculture. During the meeting papers were presented on pelleting hay, curing tobacco, citrus, perishable produce, watersheds, and the outlook for farm machinery. New officers elected for the coming year are: R. E. Choate, chairman; I. S. Exley, first vice-chairman; E. S. Holmes, second vice-chairman; H. C. Nelson, third vice-chairman; A. M. Pettis, secretary and editor; and M. H. Byrom, treasurer.

North Atlantic Section

The annual meeting of the North Atlantic Section will be held on the campus of the University of New Brunswick at Fredericton, N. B., Canada, August 21 to 23. The three-day meeting will open with a General Session on Monday morning with an address by ASAE President B. T. Virtue. The speakers' theme will be "Agricultural Engineering Related to Marketing," with talks by L. H. Holman on opportunities and needs; R. W. Kleis on curriculum requirements; D. W. Winter on research in marketing; and R. O. Gilden on extension and commercial marketing programs.

The Monday afternoon program will consist of four concurrent sessions. The Farm Structures Division will present discussions on foam plastics in farm construction, by D. A. Huebner; tilt-up insulated sandwich walls for farm construction, by R. W. Gibbs and R. B. Furry; liquid manure system, by H. M. Wenger; the performance of the New Jersey low cost solar poultry house, by C. H. Reed and R. I. Squibb; and snow patterns on farmsteads related to arrangements of buildings, by F. H. Theakston. The Electric Power and Processing Division session will cover the topics: "How a Farmer Looks at Farm Electrification," by Heywood Clarke; "Climatology and Poultry House Ventilation Practice," by J. J. Kolega; "Utilizing Industrial Control Equipment for Farm Applications," by B. D. Campbell; "Electric Heat for Milking Centers," by J. E. Horton; and "Precooling Fresh Produce," by G. A. Fitzgerald. Papers to be presented during the Soil and Water Division session will be: "Small Watershed Projects for the Northeast," by H. J. Kautz; "Methods of Constructing Earth Embankments Across Areas of Deep Muck to Create Irrigation Reservoirs," by J. N. Selby; "Design of Stone Center Waterways," by G. W. Eley; "Special Machinery for Tidal Marshland Drainage," by C. E. Henry; and "Drainage Equipment for Organic Soils," by J. V. Healy. The Power and Machinery Division will hear about minimum tillage practices for potato production, by G. W. French; equipment for side placement of fertilizer on small grains, by D. E. Clark; the adaptability of mulch tillage practices for the northeast area, by C. G. E. Downing; trends in hay conditioning equipment, by R. J. Rowe; and hay losses from components of balers and choppers, by L. F. Whitney. Monday's sessions will conclude with a lobster party and entertainment, and an Irrigation Committee panel on water resources for irrigation.

The Tuesday forenoon program will include three concurrent sessions. At a Power and Machinery session the following subjects will be discussed: Development of an asparagus harvester, by M. J. Moore; development of a blueberry harvester, by R. B. Rhoads; tests and development work on a potato harvester, by S. E. Sides; and the development of a tobacco harvester, by R. G. Light, J. H. Whitaker, and G. S. Taylor. The Soil and Water Division will present discussions on the influence of soil-moisture-plant relationships on irrigation practices, by F. W. Peikert; a comparison between measured and calculated soil moisture levels in processing tomato field, by C. H. Moran; the importance of irrigation water management, by G. Levine; cost of installing underdrainage, by E. D. Gilchrist; and engineering requirements for land drainage, by L. C. Rowe. The Electric Power and Processing and Farm Structures Divisions will hold a joint session, which will include papers on the following subjects: Mechanical egg gathering, by R. J. Bugbee; supplemental heat for poultry housing, by W. A. Junnila; the mechanization of feeding dairy cows in stanchions, by E. C. Schneider; the effect of wind and sunshine on thermal design of farm homes and service buildings, by N. C. Teter and R. G. Yeck; and air-supported farm structures, by R. H. Newcomer.

A General Session is scheduled for Tuesday afternoon at which R. A. Polson will address the group on exporting American technical assistance abroad, and C. A. Johnson will give an address on agricultural engineering's role in technical assistance. The annual banquet is scheduled for Tuesday evening with N. T. Brenner, Section chairman, acting as toastmaster.

The three-day program will conclude on Wednesday with several tours. A local farm tour will take visitors to a dairy farm, a poultry farm, and across Saint John River by ferry to inspect a new open front hog barn. Another tour will be made up the Saint John River Valley where calls will be made at various potato farms; visits will be made also at potato chip and other food processing plants. Points of interest to be visited on a marshlands tour will be a major tidal control dam and a demonstration of European drainage equipment presently being tested. Three of New Brunswick's major tourist attractions will be visited also—Magnetic Hill, Hopewell Cape, and Fundy National Park. A tour of the city of Saint John is also planned. A special program for ladies and children is scheduled for each of the three days. The local arrangements group wishes to remind those members who plan to attend that the New Brunswick area offers a fine opportunity to combine attendance at the meeting with a family vacation.

Washington, D.C.-Maryland Section

The Washington, D.C.-Maryland Section held its last meeting of the season on June 9. This was a luncheon meeting at the Log Lodge of the Agricultural Research Center at Beltsville, Md. Following the luncheon and meeting selected projects of the USDA Agricultural Engineering Research Division, Agricultural Research Service and the USDA Marketing Research Division, Agricultural Marketing Service, were visited. Individuals visited the projects of their choice and leaders were on hand for explanations, demonstrations, and questions.

The Section's fall season will open with a meeting on Friday, September 8.

ASAE MEETINGS CALENDAR

July 31 — BATON ROUGE SECTION, Agricultural Engineering Auditorium, Louisiana State University, Baton Rouge.

August 20-23—NORTH ATLANTIC SECTION, University of New Brunswick, Fredericton, N. B., Canada.

October 18-20 — PACIFIC NORTHWEST SECTION, Boise Hotel, Boise, Idaho.

October 20-21 — PENNSYLVANIA SECTION, Pennsylvania State University, University Park.

December 12-15 — WINTER MEETING, Palmer House, Chicago, Ill.

June 17-20 — ANNUAL MEETING, Mayflower Hotel, Washington, D. C.

NOTE: Information on the above meetings, including copies of programs, etc., will be sent on request to ASAE, St. Joseph, Mich.

(Above) ASAE President L. W. Hurlbut poses with Central Illinois officers. From left to right are *(seated)* C. W. Bockhop, past-chairman; Hurlbut; T. O. Hodges, chairman; D. B. Brooker, vice-chairman; and *(standing)* R. A. Saul, vice-chairman; Howard Johnson, secretary-treasurer; and J. C. Steele, vice-chairman. Picture was taken during Central Illinois Section meeting, May 6, at University of Illinois

(Below) The Florida Section elected officers for the year 1961-62 at its annual meeting on May 18 to 20 at the Daytona Plaza Hotel, Daytona Beach, Fla. Shown left to right are: R. E. Choate, chairman; I. S. Exley, first vice-chairman; E. S. Holmes, second vice-chairman; H. C. Nelson, third vice-chairman; A. M. Pettis, secretary and editor; and M. H. Byrom, treasurer

Fabric Tanks Offer Broad Usage

The Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, Ohio, has developed a new portable fabric tank for farm, con-

struction, and industrial use. The new utility tanks, ranging in capacity from 60 to 350 gal, are offered in eight sizes and are created from finely woven nylon fabric impregnated with a specially compounded rubber. The rubber coating reportedly is resistant to fuel oil, gasoline, transformer oil, liquid fertilizer and weed sprays.

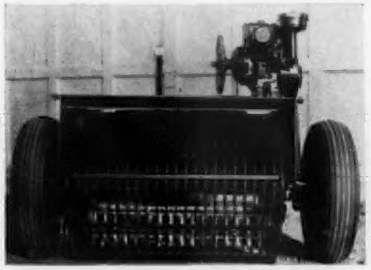
"Multi-Grader" Introduced

Tumaco Equipment, 1206 E. Main, Marion, Kans., has introduced a tractor attachment called Multi-Grader that builds, reno-

vates and maintains terraces; builds dikes, drainage systems, diversions, grass waterways, lanes, and roads; fills gullies, and grades for irrigation laterals. It can also be used as a loader to load dirt directly into trucks. Digging is performed by 28-in. disks. Dirt is discharged onto a conveyor for removal. Disks can be adjusted to dig as deep as 14 in.

Improves Stone Picker

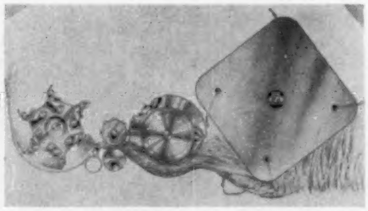
Bridgeport Implement Works, Inc., 1483 Stratford Ave., Stratford, Conn., has introduced its latest model stone picker designed



to pick stones from $1\frac{1}{2}$ to 8-in. dia. Interchangeable rakes are available for special applications in any given size from $\frac{3}{8}$-in. dia. Specifications are as follows: Width, 6 ft; length, 10 ft; height, 4 ft; weight, 1500 lb; under clearance, 1 ft; box capacity, $\frac{3}{4}$ yd (approximately 2500 lb); picking swath, 40 in. The unit has its own power plant and can pick stones on a continuous basis, until the hopper is completely loaded. The speed of the engine, which controls the speed of operation, can be varied, depending upon conditions and is not dependent upon the forward motion of the prime mover.

Forage Harvester Features New Feeding System

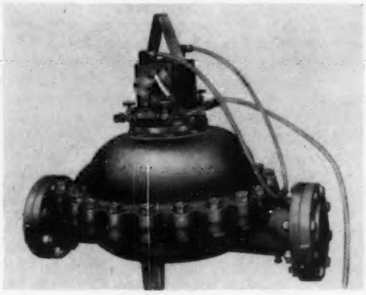
New Holland Machine Co., New Holland, Pa., has introduced its new Model 616 forage harvester featuring what is called a



new low-line "Positrol" feeding system. The new system (shown) is a short, straight-line arrangement of reel, auger, feed rolls and cutterhead that results in a positive-controlled feeding system in grass and hay crops. The two 30-in.-wide feed rolls are designed to convey a wide, smooth carpet of material to the cutterhead. They hold the crop with a reported 800 lb of pressure just 2 in. from the knives.

Large-Capacity Liquid Fertilizer

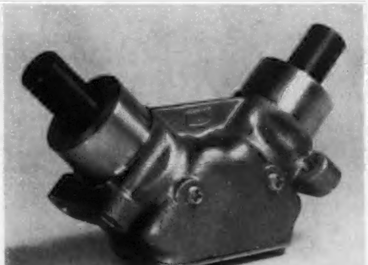
Smith Precision Products Co., 1135 Mission St., South Pasadena, Calif., has introduced new automatic fertilizer dispensers



to fit 3, 4, and 6-in. water pipe sizes. With all models, mixing of fertilizer and water in proportions is automatic and reportedly is not affected by changes in water flow or pressure. Mixing action is accomplished by the flow of water in the pipeline and fertilizer solution is drawn from open containers.

Right-Angle Gear Box

Stow Mfg. Co., 39 Shear St., Binghamton, N. Y., has announced a new 90-deg gear box designed for making sharp bends



in rotary-type remote control linkages. This completely enclosed right-angle gear box consists of a cast bronze housing and two spindles with bevel gears supported in needle bearings. The bronze housing has tapped holes for bolting in place. The gears are splined internally and are pinned for laterally holding only. Torque capacities range in three sizes from 500 to 3500 in-lb. Spindle stub shafts are available either keyed or splined in whatever diameter is required to attach to universal joints for reach rod controls or to attach to flexible shafting as follows: $\frac{1}{2}$ to $1\frac{1}{4}$-in. shaft sizes for flexible shafting and $\frac{1}{2}$ to $1\frac{1}{2}$-in. for rigid rod sizes.

Universal Mounted Corn Picker

New Idea Farm Equipment Co., Coldwater, Ohio, has introduced what it claims is the first mounted corn picker designed to

fit all popular tractors. A special "universal" sub-frame fits old and new tractors, and simple axle brackets are the only mounting parts that vary from tractor to tractor. Two husking beds (a completely new, fully-mounted husking unit, and a trailing husking bed) are used. Either bed can be removed so that the gathering unit may be operated with a field sheller or a field grinder. The 8-in.-wide first elevators and a 14-in.-wide wagon elevator provide for large capacity. An ear deflector provides load leveling. The husking bed features two cast iron and two serrated rubber rolls on each side.

8-Plow Diesel Tractor

Oliver International, S. A., 400 W. Madison St., Chicago 6, Ill., exhibited its new Model 1900 two-wheel-drive diesel tractor

at the International Agricultural Exhibition March 21 to April 21 in Cairo, Egypt (U.A.R.). According to the manufacturer, the tractor has more than 94 corrected belt horsepower, has pulled an 8-bottom plow through more than 4 acres of soil an hour, pulls 12,475 lb at the drawbar, and weighs nearly 11,000 lb.

(Continued on page 378)

. . . New Products

(Continued from page 377)

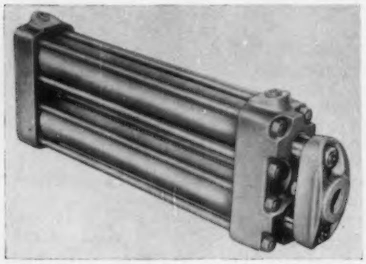
New Corn Pickers

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has announced two new 2-row corn pickers, both over-the-axle mounted models,

designed to provide big-capacity, ear-saving operation, with minimum shelling; fast, clean delivery of ears to the wagon; and easy mounting on the tractor. One picker is identified as the Model 170 and is designed for the A-C D-17 tractor. The other, Model 150, is for use with either models D-15 or D-14 tractors. Features include newly-designed center divider and gathering points, adjustable stripped plates over snapper rolls, new husking beds with rubber-on-rubber action, and four husking rolls per row with overhead floating feed conveyor.

Center-Hole Hydraulic Cylinders

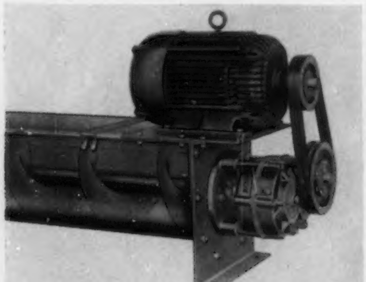
Precision Hydraulics Div., Owatonna Tool Co., 359 Cedar St., Owatonna, Minn., has announced a new line of 10,000-psi



twin-cylinder, "center-hole" double-acting hydraulic cylinders with choice of stroke length. The new YDT series cylinders are available in bore sizes of two 1½ in., two 2 in. and two 2½ in. with push capacities of 17, 30, and 50 tons at 10,000 psi. Cylinders are designed primarily as push cylinders but with sufficient pull or piston return for limited full capacity use.

Conveyor Drive

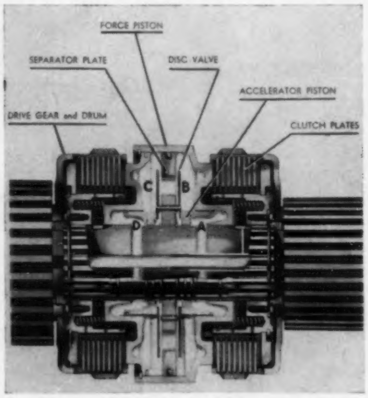
Dodge Mfg. Corp., Mishawaka, Ind., has announced a new compact screw conveyor drive especially designed for short conveyor



flights and low horsepower requirements. Identified as Series 100, the new drives are offered in two speed ratios: 8:1 for up to 6 hp at 225 rpm; and 18:1 for up to 3.8 hp at 100 rpm. The unit consists of a double-reduction speed reducer with packing gland and driving shaft which mounts on a trough end. Trough ends are also available. Further details are available in Bulletin 601, furnished upon request from the manufacturer.

New Hydraulic Clutch Line

Rockford Clutch Division, Borg-Warner Corp., Rockford, Ill., has introduced its new line of power shift hydraulic clutches for a



wide range of transmissions and machinery. The new clutches are available in 6 sizes to handle torque loads from 1,000 to 10,000 lb ft, engines up to 1,000 hp and speeds up to 5,500 rpm. The dual-drive design is said to give end-to-end shifting with extremely smooth and fast engagements.

The manufacturer reports that modulated torque or gradual pressure buildup in the clutches gives cushioned starts under any load. The clutches reportedly transmit only enough torque to complete the shift, then continue to maximum capacity. The new clutch is actually two clutches on one shaft. Drawing shows the dual-drive clutch in a neutral position. White areas show cavities which are under lube oil pressure when disengaged. In operation the force piston can be actuated to move axially in either direction, thus compressing clutch plates of either left or right hand clutch. The compressed plates drive the drum and gear of their respective clutch. Since the clutch transfers oil from one side of the separator plate to the other, only pressurization of the piston cavities is needed to fully engage the clutch. Apply oil pressure enters the piston cavities through the center of the shaft. The left hand clutch is actuated by oil pressure through the tube in shaft, while the right hand clutch is actuated by oil pressure through the open area around the tube in shaft. Introduction of apply oil pressure into cavity A begins a dual movement of accelerator piston toward separator plate and force piston toward right hand clutch plates. Action of the accelerator piston and disc valves permits a unique oil transfer across the separator plate from cavity C to cavity B. A gradual pressure available in shaft sizes from ½ to $1\frac{7}{16}$-in. buildup from cavity A to cavity B is accomplished by oil pressure through the small orifice in the accelerator piston. This automatic torque modulation completes full engagement of the right hand clutch. Release of apply oil pressure gives instantaneous disengagement.

Zinc-Magnesium Alloy for Hot-Dip Galvanizers

The Dow Chemical Co., Midland, Mich., has announced availability of a zinc-magnesium alloy for the hot-dip galvanizing of steel for improved corrosion resistance. According to a Dow spokesman, first to reach the market with this alloy (97 percent prime western zinc, 3 percent magnesium) is Eagle Picher Co. Thus far, the only method of commercially applying the new process has been to add magnesium ingot directly to the bath. The zinc-magnesium alloy is designed to simplify the process and will be used in combination with regular prime western slabs.

Expands Cylinder Lines

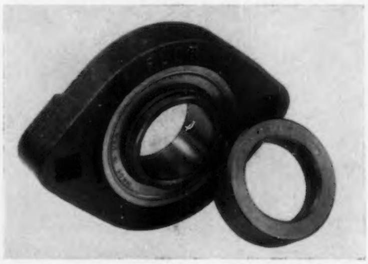
Prince Mfg. Corp., Sioux City, Iowa, announces addition of several new models to its line of hydraulic cylinders. The line

includes cylinders with bores of 1⅛, 1⅜, 1¾, and 2½ in.; and strokes of 8, 10, and 12 in. for use with A-C tractor systems.

Also announced is production of a new remote cylinder for trailing implements, referred to as the Crown model. All models meet ASAE specifications and are available currently from distributor stocks.

New Cast Iron Flange Bearing

The Fafnir Bearing Co., 37 Booth St., New Britain, Conn., has announced a new low-cost ball bearing in a flange-type iron



housing. Known as the FLCT, this unit consists of a compact cast iron housing with a standard inner ring ball bearing and self-locking collar. The combination square and round bolt holes will accommodate carriage bolts or standard machine bolts. The bearing face on the collar is located flush with the face of the casting in such a way that water will not puddle when mounted for vertical shaft applications. The frame side is recessed to allow water or dirt to bypass as well as to prevent build-up of air pressure against the bearing seal. Units are available in shaft sizes from ½ to $1\frac{7}{16}$-in. O.D., except for $\frac{13}{16}$-in. O.D.

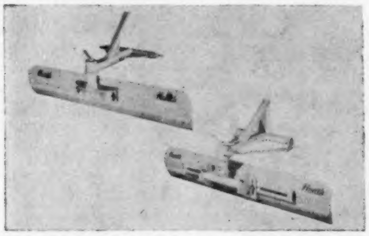
Bearing Equipped Idler Sprockets

Diamond Chain Co., Inc., 402 Kentucky Ave., Indianapolis 7, Ind., has announced its new Uni-Mount idler sprockets which

are bearing-equipped and fully assembled to simplify procurement and installation on all types of equipment using roller chain drives. The oil impregnated bearing is a press fit in the sprocket bore and a slip fit over the case-hardened steel journal. Steel washers are a press fit over the steel journal to complete the assembly and provide lateral clearance between working parts.

Rear-Mounted Blades

Heath Engineering Co., 168 Ault Rd., Ft. Collins, Colo., has introduced two new rear-mounted blades, models 30 and 40,



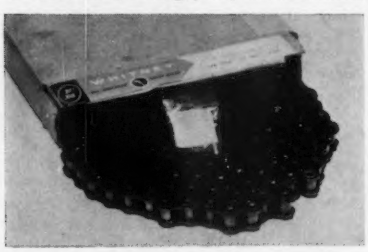
constructed of welded tubular steel. Featuring a 360-deg pivot assembly with quick release lock handle, these blades can be adjusted to any of 24 locking positions without the use of a wrench. Model 30 has 26 adjustments for obtaining the desired ground engaging angle and cutting action. Model 40 has 37 adjustments to control the angle and pitch of the moldboard for scraping, ditching, and backfilling. The curved moldboard with replaceable cutting edge is available in 6 and 8-ft lengths. Standard 3-point and 1 or 2-point hitch styles are available.

New Zinc-Coated Steel

Armco Steel Corp., Middletown, Ohio, has developed a new spangle-free, hot-dipped zinc-coated steel, developed specifically to improve paintability characteristics and weldability of current paintable galvanized steels. The new material, designated Zincgrip A, Paintgrip, is chemically treated and reportedly carries a 1.25-oz class zinc coating as specified by ASTM A-93. The new sheet also is produced in light commercial coating weight. For applications not requiring maximum paintability, the special chemical coating can be eliminated. According to the manufacturer the new material can be drawn, formed and lock seamed to the limit of the base metal without flaking or peeling of the coating. At present it is available in coils and cut lengths in gages 16 through 24 and widths up to 36 or 48 in., depending upon gage.

Self-Lubricating Chain

Whitney Chain Co., subsidiary of Foote Bros. Gear & Machine Corp., 4545 South Western Ave., Chicago, Ill., has announced



a new line of self-lubricating power transmission and conveyor chains now available in 1-in. pitch. The expanded line is available in single, double, triple, and quadruple strands and in riveted or cottered type. Average ultimate strengths range from 13,000 lb in single strand to 52,000 lb in quadruple strands. In operation, the lubricant contained within the bushing expands and flows over bearing surfaces. When the drive stops, the lubricant reportedly contracts and is reabsorbed by the bushing. This cycle reportedly continues throughout the chain's service life and no additional oil is said to be required.

CHECK POINTS

by J. L. BUTT

A YEAR OF PROGRESS

EACH year, your ASAE headquarters staff prepares an annual report which is presented to the ASAE Council and made available to those attending the Society's annual business meeting. Normally, between three and four hundred copies are distributed. For my column this month, I am going to summarize the contents of the 1960-61 report so that *all* our members will have a thumbnail sketch of the Society's year of progress. For those wishing copies of the complete 12-page report, please direct a request to ASAE headquarters.

Obviously, in the short space available, only the high points in a year of progress can be reported. But we believe the following account will convey to the membership a better concept of the scope, significance, and importance of ASAE in the advancement of the agricultural engineering profession.

Career promotional activities rated major attention during the year. Approximately 30,000 movie promotional flyers and 50,000 folders describing agricultural engineering were distributed in connection with showings of the 141 prints of the Society's career movie. Prints have been shown in at least three continents, and the picture has been described in many magazines with national circulation. Continued promotion of the motion picture is urged, not only for its primary purpose of conveying accurate career information to young people but also as a means of acquainting the general public with the field of agricultural engineering.

"Agricultural Engineering—The Profession with a Future," the Society's career movie, was accorded first place in the "Guidance — Personal and Vocational" category at the Third American Film Festival. This recognition will result in considerable publicity for the film throughout the nation. It has already been shown for the second consecutive summer at the Patio Theatre in Washington, D. C. and will be shown at the Chicago International Trade Fair between July 25 and August 10.

ASAE continued its cooperation with JETS (Junior Engineering Technical Society). Individual ASAE members have cooperated with JETS chapters in arranging plant visits, serving as guest speakers, and providing technical assistance. The Society presented subscriptions to AGRICULTURAL ENGINEERING to all students entering agricultural engineering exhibits in the JETS national competition. There were seven entries this year as compared with two a year ago.

A decision was made for ASAE to sponsor an "Agricultural Engineering Exposition" in connection with its 1961 Winter Meeting. The Shea Expositions Corporation will manage the Exposition for ASAE, and the ASAE Council announced that it felt the exhibits activity would add a "new dimension" to the Society's Winter Meeting by providing an opportunity for members to see the latest in machines, components, techniques and practices, in addition to the usual technical sessions and committee meetings.

A special Conference on Farmstead Engineering was held last September in cooperation with the University of Illinois and the USDA. The September 1960 issue of AGRICULTURAL ENGINEERING carried the proceedings of this Conference which drew 218 registrants from 29 states and several foreign countries. This was an example of how the Society can coordinate and support technological developments relating to agricultural engineering.

Four new ASAE standards were developed during the year, and eight others revised. One new ASAE section, the Acadia Section, was authorized during the year, bringing the total to 31.

Membership in ASAE, as of May 1, 1961, was 5,812 as compared with 5,502 in 1960. Approximately 200 senior student members will be eligible for transfer to Associate Member status during May and June. The Society had 767 Student Members during the year, and a total of 1,268 student branch members in the 40 active student branches.

The ASAE Education and Research Division, for the first time in several years, sponsored a half-day technical session during the Annual Meeting at Ames. The Society and its members have given active support toward developing a stronger agricultural engineering division of the American Society for Engineering Education. An excellent divisional program was developed for the ASEE meeting in Kentucky on June 30.

Thirty-one agricultural engineering departments are now ECPD accredited — New Mexico State University was accredited during the year. ASAE now recognizes 47 curriculums in the United States and Canada. The Curriculum and Course Content Committee announced a new policy which will require reconsideration of all ASAE-recognized curriculums every five years.

The Society established new or expanded contacts with several organizations on items of mutual interest. Eight such organizations were listed including trade associations and other professional groups.

ASAE was elected to full, constituent membership in Engineers Joint Council and to full membership in the International Commission of Agricultural Engineering (CIGR) during the year. It was pointed out that both memberships not only result in increased stature and prestige for the agricultural engineering profession; but that they also represent additional Society responsibilities — in committee work, cooperative activities, and financial obligations.

The development of a Publication Policies and Finances Committee to work specifically on publication problems was described. Items being considered by the committee are: (1) defining purpose and objectives of each Society publication; (2) further study of screening procedure for selection of articles; and (3) careful study of methods of financing an expanded publications activity.

The journal carried more editorial pages in 1960 than in any previous year. The Yearbook continued to carry pertinent technical data including standards, MS and Phd theses, tractor test results, data, product directory, and membership list. TRANSACTIONS OF THE ASAE carried essentially the same amount of editorial coverage of technical articles as did AGRICULTURAL ENGINEERING in 1960. A decision was reached that the Society should inaugurate a monograph series — subject matter for monographs to be cleared through pertinent divisions and a new Society Monograph Committee. Spot checks reveal that technical papers are being requested of ASAE headquarters at the rate of around 2,600 per year, with over 85 percent of the requests coming from members using technical paper order forms.

Your Society operated in the black during 1960. In analyzing the various Society functions, those activities charged against purely Society activities showed a slight loss, the Yearbook essentially broke even, a slight surplus from the journal made up for the deficit in Society activities, and Transactions showed a slight profit over expenditures (although no overhead was assessed against Transactions). Major concern of the Finance Committee at the moment is directed toward planning ahead and establishing a financial structure to achieve desired growth and to take full advantage of opportunities for further development of your organization.

The personnel service function of the Society handles a few more requests each year. During the first half of 1961, approximately 300 requests for service were answered. This service provides maximum value when the positions-open and positions-wanted listings remain in relative balance; unbalance in either direction results in undesirable situations.

The Society's public relations activities have been expanded considerably within the past two years. A definite schedule of releases covering the ASAE President's speaking engagements, new Fellows, ASAE award winners, journal authors, are handled routinely. An active program of contacts covering national meetings has been developed which includes radio, TV, newspaper, and magazine editors.

Advertising in the Society publications was favorable for the year 1960, as compared with previous years, but a very strong downward trend was reported for the first half of fiscal 1961. Encouraging signs are evident which will influence advertising income for the second half of 1961.

This was your organization's year of progress, 1960-61. Of course, the section meetings, the national meetings, the considerable amount of committee work, and other such activities, which recur each year, are not reported. But this brief sketch should give those of you who do not have the opportunity of attending the Society's annual business meetings a better opportunity to become familiar with some of the efforts which united action through ASAE is rendering in *your* behalf.

MANUFACTURERS' LITERATURE

Literature listed below may be obtained by writing the manufacturer.

Automatic Feed Handling System Bulletin

Babson Bros. Co., 2843 W. 19th St., Chicago 23, Ill. — A 4-page, 2-color bulletin includes description and illustrations of the Surge automatic feed handling system. Also included are typical installations, illustrated with drawings.

Air and Hydraulic Cylinder Bulletins

Mo-Bar Hydraulics Co., Crystal Lake, Ill. — Hydraulic cylinders are described in a Series 'h' Bulletin No. 204, covering high pressure cylinders, $1\frac{1}{2}$ in. to 12 in. bore, 2,000 to 3,000 psi. The Series 'm' Bulletin No. 203 covers medium pressure cylinders, $1\frac{1}{2}$ in. to 14 in. bore, 500 to 2,000 psi. The Series 'a' Bulletin No. 202 describes air cylinders, $1\frac{1}{2}$ in. to 14 in. bore, to 200 psi. All three bulletins show enlarged cross-section views of cylinder construction, with detailed cylinder specifications, mounting styles, and cylinder accessories.

Injection Pump Bulletin

Precision Mecanique Labinal, 14, rue Daviel, Paris, France — A 4-page, 2-color bulletin describes and illustrates an injection pump with a "liquid stop". Also included is a listing of its general characteristics.

Industrial Rubber Products

Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J. — A 24-page general catalog includes sections on poly-V drive, V-belts, transmission belt, conveyor belt, all types of hose, flexible rubber pipe and expansion joints, plus a summary of molded and extruded products.

Roller Chain Catalog

Diamond Chain Co., Inc., 402 Kentucky Ave., Indianapolis 7, Ind. — Catalog No. 760 describes and illustrates stock roller chains, sprockets and couplings and carries ARSCM horsepower ratings. In addition it gives full information on the company's new products in the power transmission and conveying field — the Dura-Weld top plate conveyor chain, Tuf-Flex heavy-duty roller chain, Micropitch miniature roller chain, and Hi-Cap flexible couplings.

Fractional Horsepower Motor Bulletin

Reliance Electric and Engineering Co., 24701 Euclid Ave., Cleveland 17, Ohio — An 8-page, 4-color bulletin, No. B-2514, describes the construction and design details of the Duty Master fractional horsepower motor. Each point is illustrated with photos and drawings, and a life-size photo of a cutaway motor is shown in full color.

Hydraulic Bulk Box Dumper Circular

Friday Tractor Co., Hartford, Mich. — A one-page circular describes and illustrates the Universal model hydraulic bulk box dumper. Dumper will handle boxes up to a maximum size of 48 in. x 48 in. x 34 in. A one-hp single or three-phase motor is used.

Circular Roller Chain

Acme Chain Corp., Holyoke, Mass. — Bulletin No. 8, a 4-page, 2-color piece, describes and illustrates circular chain, including a typical installation. Standard dimensions for conveyor chains are also included. *(Continued on page 382)*

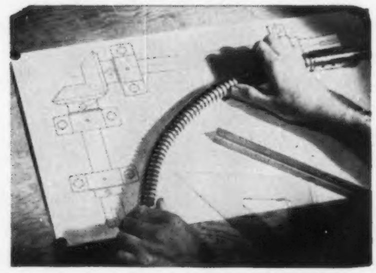
ADVANTAGES OF FLEXIBLE SHAFTING

For Power Drive and Remote Control

by C. HOTCHKISS, JR.

Application Engineer,

Stow Manufacturing Co.



RELATIVE MOTION—Where two shafts which have relative motion must be connected, flexible shafting is often the ideal means of transmission. In many cases it eliminates a much more complicated drive which would, necessarily, include telescopic joints; further, it eliminates the danger of exposed moving parts. See figure 2, which shows a $\frac{3}{4}$-inch Stow flexible shaft driving an Avery Rake built by the Minneapolis Moline Co.

Flexible shafting has the following advantages over other type drives:

1—It is often the simplest method of transmitting power between two points which are not collinear or which have relative motion

2—eliminates exposed revolving parts

3—does not require accurate alignment

4—easy to install and maintain.

NOT COLLINEAR—Where it is necessary to connect two shafts which are not collinear, a simple arrangement of a single belt or two universal joints will often do the job adequately. But, in many cases where the path of transmission is more complicated and would require a more expensive arrangement of mechanical components, flexible shafting provides a simple, low cost, efficient drive which is easy to install because it does not require accurate alignment. See example, figure 1, in which a $1\frac{1}{4}$-inch Stow flexible shaft is used to drive the auger on a G.L.F. bulk feed truck.

Flexible shafting also allows the designer greater freedom in locating either the drive or the driven component on a piece of equipment.

Fig. 1

Fig. 2

Other typical applications of this type are used on portable power tools when motors are too heavy to be mounted on the tool—such as portable grinders, sanders, paint scrapers, saws and tree tappers. And, since flexible shafting is not affected by vibration, it is an ideal drive for applications where a high degree of vibration is involved — such as in vibration testing tables and concrete vibrators.

Stow flexible shafts are available: for power drive applications in diameter sizes from $\frac{1}{8}$ inch to $1\frac{1}{4}$ inches; for remote control applications in diameter sizes from $\frac{1}{8}$ inch to $1\frac{3}{8}$ inches.

The $1\frac{1}{4}$ inch power drive shaft will transmit up to 10 HP while the $1\frac{3}{8}$ inch remote control shaft will transmit up to 4000 lb. in.

For complete engineering data on flexible shafting, including selection charts, write for engineering bulletin 570.

STOW MANUFACTURING CO.

39 SHEAR STREET • BINGHAMTON, NEW YORK

. . . Manufacturers' Literature

(Continued from page 381)

Feeding and Handling Equipment

American Planter Co., Burr Oak, Mich.— Three pieces are offered: Bulletin 33, an 8-page, 2-color booklet, describes and illustrates feed handling equipment designed for grain elevators, storage and warehouse operators, contractors, feed mills, and processing plants; Bulletin 34, a 2-color brochure, describes and illustrates mechanical bunk livestock feeding; and a 66-page catalog entitled "The Keys to System Farming" describes and illustrates complete line of feeding and handling equipment.

Chain Pitch Wall Chart

Foote Bros. Gear & Machine Corp., Dept. MJ, 4545 S. Western Blvd., Chicago 9, Ill. — A quick selection wall chart for choosing recommended chain pitch sizes for power transmission chain is printed on heavy paper suitable for easy wall mounting or filing. The 2-color chart lists design horsepower on the vertical axis and rpm speeds for the small sprocket on the horizontal axis.

Bulk and Package Handling Conveyors

Conveyor Systems, Inc., 6451 Main St., Morton Grove, Ill. — A 56-page, 2-color brochure (Catalog 70) incorporates many illustrations of engineered systems, special applications, and package and bulk handling equipment. Automatic and semi-automatic system handling with custom engineered installations is covered by some 40 pages of illustrations and application data. Outlines of the engineering services offered by the company and the parts and repair facilities maintained for servicing customer installations is also included.

Line Diverter

Air Conveying Division, Flo-Tronics, Inc., 1420 Zarthan Ave., Minneapolis, Minn.— An illustrated specification sheet describes the flo-seal line diverter for fast and efficient selection of two conveying lines. Complete physical and operating specifications are detailed in the literature. Full warranty and ordering information are also given.

Portable Gas and Electric Trough Conveyors

A-B Farquhar Division, Conveyor Systems, Inc., 6537 Main St., Morton Grove, Ill.— A 2-color catalog describes complete line of portable, gas and electric-powered, trough conveyors for handling bulk materials. New design improvements are featured, as well as a range of optional equipment for handling specialized work.

Area Floodlighting

Crouse-Hinds Co., Syracuse I, N. Y.— Bulletin 2719, a 16-page, 2-color brochure, is a reference guide for selecting incandescent or mercury floodlights, general purpose or heavy duty types. Footcandle charts and installation diagrams are included, along with listings of floodlights and mounting accessories.

High Temperature Bearing Materials

Aetna Ball and Roller Bearing Co., 4600 Schubert Ave., Chicago 39, Ill.— A 4-page folder entitled "Bearing Materials for High Temperature Applications" gives available information on some of the various types of materials suitable for high temperature bearing applications and points up some of the pitfalls encountered in their use.

Soil Testing Equipment

Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill.— A 12-page bulletin, No. C-117-61, describes and illustrates samplers, soil thermometers, chemical testing kits, conductivity test apparatus, soil color charts, moisture instruments and classification devices for the testing of soils in agriculture, irrigation, soil conservation, landscaping and forestry.

The Farm Shop, by T. J. Wakeman and Vernon Lee McCoy. Cloth. 6½ x 10 in. ix+597 pages. Illustrated and indexed. Published by The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. $5.60.

According to the author, this book is written with both the beginning and the veteran farm shopworker in mind. Techniques in the uses and applications of nearly all hand and power tools usually found in the shop of a modern farm are presented step by step. The arrangement of the 16 chapters follows the order in which the authors teach their own students and include: Sketches, Plans and Drawings; Establishing a Home Farm Shop; Tool Fitting; Cold Metalwork; Hot Metalwork; Arc Welding; Gas Welding; Soldering and Sheet Metalwork; Farm Carpentry; Hand Woodworking; Power Woodworking; Painting and Glazing; Home Plumbing; Farm Masonry; Rope Work; and Using Electric Current. Also included are 70 practical projects for developing skills.

Fuel Cells, Power for the Future, by graduate students at the Harvard Business School. Paper. 8½ x 11 in. 160 pages. Illustrated. Published by Fuel Cell Research Associates, P.O. Box 157, Cambridge 38, Mass. $18.75.

This book is a technical and economic analysis of developments and opportunities in electrochemical fuel cells. There were two objectives for this study: One to determine the commercial and engineering practicality of present and potential fuel cells; and the other to investigate the status of fuel cell technology and to present the technical operations and limitations of fuel cells. The book is divided into nine chapters under the following headings: Fuel Cells — Power for the Future?; A Technical Review of the Electrochemical Processes and Limitations of Fuel Cells; Fuel Prospects and Considerations; Criteria for Fuel Cell Evaluation; Performance and Economic Analysis of Present and Expected Fuel Cell System; The Fuel Cell Mechanical Power System; Fuel Cells in Mechanical Power Applications; Fuel Cells in Electrical Power Applications; and Fuel Cells — Power for the Future.

Find a Career in Agriculture, by Clyde H. Duncan. Cloth. 5½ x 8½ in. 160 pages. Illustrated and indexed. Published by G. P. Putnam's Sons, 210 Madison Ave., New York 16, N. Y. $2.75.

This book, according to the author, is a guide to the young reader concerning varied careers open in the modern business and technology of agriculture, as well as giving information on farming and ranching, including research, education, government, communications, and related fields. Its chapters include agriculture in a changing world; farmers and ranchers; agricultural careers off the farm; from farm to test tube; agricultural careers in government; the agriculturist as an educator; agricultural careers in communications; careers related to agriculture; the "ag" colleges; financing your college education; and what is the future in agriculture.

Farm Building Design, by Loren W. Neubauer and Harry B. Walker. Cloth. 6 x 9 in. xii+611 pages. Illustrated and indexed. Published by Prentice-Hall, Inc., Englewood Cliffs, N. J. Trade edition, $12.00. Text edition for classroom adoption, $9.00.

This book is divided into two sections: Part I includes general information and data regarding animal shelters, storage and processing buildings, other facilities and residences; Part II describes materials of construction commonly used on the farm, proper use, efficient design, loadings, and costs. According to the authors, chapters are arranged to begin with the practical aspects of farm structures, progressing through the simpler plans and designs, on to more complicated situations. They also point out that a functional approach is used throughout.

Marinas — Recommendations for Design, Construction and Maintenance, Second Edition, by Charles A. Chaney. Cloth. 8¾ x 11¼ in. 247 pages. Illustrated. Published by National Association of Engine and Boat Manufacturers, Inc., 420 Lexington Ave., New York 17, N. Y.

This volume, according to the author, offers designers and builders a manual of construction methods and materials, and the data are presented as a complete instrument to assist those intending the financing, planning, construction and management of modern marinas. It contains chapters on such subjects as the preliminary studies and investigations, construction costs, rentals, maintenance and operation, but the greater portion of the text is devoted to up-to-date data previously discussed in the two earlier books; namely, the consideration of the planning and construction problems. Various construction materials with their grades, species, and classes are considered, and definite recommendations are made as to their quality, physical capacities and durability under varying conditions.

The 1961 Britannica Book of the Year, edited under the direction of Harry S. Ashmore. Cloth. 8½ x 11½ in. 777 pages. Illustrated and indexed. Published by Encyclopaedia Britannica, 425 N. Michigan Ave., Chicago, Ill.

This book is the annual supplement to Encyclopaedia Britannica, covering principal events of the past year, and is an illustrated factual record of these events. It contains 1,000 articles and more than 500 photographs, charts, maps, and cartoons. Two survey-feature articles, which lead off the book, are of special interest. "The Voice of Latin America," by William Benton, is the report of his trip through Central and South America in 1960 with Ambassador Adlai Stevenson, and "Healthy Added Years," by Edward L. Bortz, is a discussion of the problems, with possible solutions, which face the United States as the number of older people increases.

In addition to the books that have been reviewed above, the following are listed only by title, authors, publisher, size, and price.

Water System and Treatment Handbook. Published by the National Association of Domestic and Farm Pump Manufacturers, 1028 Connecticut Ave., N.W., Washington 6, D.C.

Land, Water and People, by Otis Tossett. Cloth. 143 pages. Published by the Soil Conservation Districts Foundation, Inc., P.O. Box 776, League City, Texas. Price, $3.00.

Farm Electric Sales Handbook (Revised). 4½ x 7½ in. Loose-leaf notebook. 114 pages. Published by Edison Electric Institute, 750 Third Ave., New York 17, N. Y. Price, $2.75 ($4.25 with binder).

. . . 54th Annual Meeting

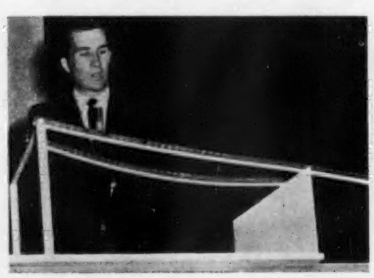
(Continued from page 375)

E. G. McKibben, director of Agricultural Engineering Research Division, ARS, USDA, and past-president of ASAE, extends special invitation to Byron T. Virtue, new president of ASAE, to come to Washington, D.C., for the 55th Annual Meeting of ASAE in June 1962

Several ASAE members and C. Robert Myers, president of Myers-Sherman Co., and president of Grain Processing Machinery Manufacturers Association (GPMMA), had an opportunity to discuss mutual interests during the meeting. Seated *(left to right)* are E. G. McKibben, past-president of ASAE; Byron T. Virtue, president of ASAE; Myers; and A. W. Farrall, president-elect of ASAE. Standing *(left to right)* are: H. B. Pfost, professor of flour and feed milling industries, Kansas State University; J. L. Butt, executive secretary of ASAE; and J. H. Wessman, secretary-treasurer, GPMMA

place award was won by John P. Cannon, Utah State University, for his paper entitled "Cantilever Construction in Farm Sheds," which was later presented during the ASAE annual business meeting. Second place winner was Barrie L. Smith, University of Saskatchewan, for his paper entitled "Testing Hydrostatic Power Transmission Equipment." Leroy K. Pickett, Kansas State University, was the third place winner for his paper entitled "The Effect of a Film Lubricant Applied to the Screw Upon Auger Performance."

The FEI student dinner was held on Tuesday evening. FEI Agricultural Research Committee Program Chairman Karl Butler introduced the principal speaker of the evening; Eugene F. Schneider, vice-president of International Harvester Co. W. L. Sprick, design engineer, Caterpillar Tractor Co., presented the FEI trophy awards to the following ASAE Student Branches in recognition of outstanding initiative and accomplishment: Group A — Winner, Georgia Student Branch; Honorable Mention, Illinois and Ohio Student Branches; Group B — Winner, Missouri Student Branch; Honorable Mention, Colorado and Nebraska Student Branches. For the purpose of the competition, student branches are divided into two groups based on size of membership — Group A comprising the larger branches and Group B the smaller. In each group a trophy and certificate are awarded the winning branch, along with honorable mention certificates to the second and third place winners.



John P. Cannon, Utah State University, demonstrates cantilever construction in farm sheds as he presented the winning student paper during the General Session on Tuesday morning

William Fischer, marketing director, Shea Expositions Corp., addressed both the Cabinet meeting on Sunday and the General Session on Tuesday to report on the progress of the coming AE Exposition to be held during the Winter Meeting in Chicago, December 12 to 15

Annual Dinner Program

Leon F. Charity, associate professor, agricultural engineering department, Iowa State University, was master of ceremonies at the Annual Dinner, which was held on Wednesday evening, with the invocation given by the Reverend John G. Davies, pastor, Collegiate Presbyterian Church, Ames, Iowa. L. W. Hurlbut, president of ASAE, presented the following awards: The Cyrus Hall McCormick Medal to John R. Orelind, retired manager of farm implement engineering, International Harvester Co.; the John Deere Medal to Virgil Overholt, professor emeritus of agricultural engineering, Ohio State University; and the Metal Building Manufacturers Association Award to James S. Boyd, head of farm structures section, agricultural engineering department, Michigan State University. Following the presentation of awards, Byron T. Virtue, consultant for the Bearings Division, Torrington Co., Torrington, Conn., was inaugurated as the new ASAE president. Music throughout the dinner hour was provided by Dave George. A dinner dance completed the evening's festivities, with music furnished by Don Hoy and his orchestra.

Interesting sidelines to the meeting were such events as an open house in honor of Henry Giese, professor of agricultural engineering, Iowa State University, by former graduate students and friends. Professor Giese received a plaque and a sheaf of

(Continued on page 389)

Mr. and Mrs. J. E. Waggoner were honored during Wednesday evening banquet. Mr. Waggoner was introduced as the first agricultural engineering graduate. He received the degree of Bachelor of Agricultural Engineering (B.A.E.) from Iowa State University in 1910

The following is a list of recent applicants for membership in the American Society of Agricultural Engineers. Members of the Society are urged to send information relative to applicants for consideration of the Council prior to election.

Baldo, Muhammad — Agr. engr., Land Use and Rural Waters Dept., Ministry of Agriculture, Khartoum, Sudan

Barrelier, Olegario C. — Chief engr., central zone, Departamento de Ingenieria Agricola, Ministerio de Agricultura, Comercio, e Industrias, Republica de Panama. (Mail) Apartado 6270, Panama, R. P.

Burnett, Gilbert I. S. — Asst. engr., Poverty Bay Catchment Board, P.O. Box 338, Gisborne, New Zealand

Coombs, Wendell P. — Product engr., Durkee-Atwood Co., 215 N.E. Seventh St., Minneapolis, Minn.

Dahlgren, Douglas E. — Proj. engr., Lilliston Implement Co. (Mail) 1132 Mary Ave., Albany, Ga.

Ellis, Joe A. — Agr. engr., (SCS) USDA. (Mail) 4719 E. Princeton, Fresno 3, Calif.

Hall, Lewis R. — Agr. engr., div. of ind. safety, Dept. of Ind. Relations, State of California. (Mail) 2505 Carlson Blvd., Richmond, Calif.

Hazell, Gordon G. — Mgr. field eng. dept., The Ruberoid Co. (Mail) Room 724, Transportation Bldg., Washington 6, D.C.

Jegede, Joshua F. O. — Agr. superintendent, Ministry of Agr. and Natural Resources. (Mail) c/o R. J. Silkett, program spec., FAS-USDA, Washington 25, D.C.

McKillip, James V., Jr. — Sales mgr., Universal Hoist Co. (Mail) 1704 Pinoak Dr., Cedar Falls, Iowa

Nafziger, Marvin L. — Des. engr., Lilliston Implement Co. (Mail) R.R. 1, Baconton, Ga.

Rinnan, Harold — Soil science advisor, ICA, APO 254, New York, N. Y.

Talbert, Virgil O. — Res. rep., International Harvester Co., 180 N. Michigan Ave., Chicago, Ill.

Tanke, Willard H., Sr. — Chief engr., in charge of res. and dev., Allis-Chalmers Mfg. Co., LaCrosse, Wis.

TRANSFER OF MEMBERSHIP

Aiken, Charles R. — Agr. engr., National Rural Electric Co-op. Association. (Mail) 202 Paul Spring Rd., Hollin Hills, Alexandria, Va. (Affiliate to Member)

Horne, Burton S. — Ext. agr. engr., The Pennsylvania State Univ., 107 Agricultural Eng. Bldg., University Park, Pa. (Associate Member to Member)

Palmer, John E. S. — Sr. agr. engr., Ministry of Agriculture, Samaru Zarim, N. Nigeria, Africa (Associate Member to Member)

Richardson, Harvey H. — Civil engr., (SCS) USDA. (Mail) 1795 E. Dunedin Rd., Columbus 24, Ohio (Associate Member to Member)

STUDENT MEMBER TRANSFERS

Addink, John W. — Agr. eng. dept., South Dakota State College, Brookings, S. D.

Alby, Eugene D. — (Washington State University) Serdy's Trailer Court, Pullman, Wash.

Alishahi, Mohammad R. — (Washington State University) Box 673, C. S., Pullman, Wash.

Ambrose, Ben T., Jr. — (University of Georgia) R.R. 1, Vienna, Ga.

Anderson, Howard L. — (Louisiana Polytechnic Institute) R.R. 1, Wisner, La.

Anderson, Maynard E. — (North Dakota State University) Green Giant Co., Montgomery, Minn.

Appel, David H. — (Washington State University) Endicott, Wash.

Ash, Gary W. — (Michigan State University) Box 76, Life of Riley M. H. Park, 2691 S. Washington Rd., Lansing, Mich.

Baird, Thomas B. — (Kansas State University) R.R. 1, Arkansas City, Kans.

Barkas, William M. — (Louisiana Polytechnic Institute) Box 96, Dubach, La.

Bass, Terence P. — (University of Arkansas) Gillett, Ark.

Beckman, David H. — (University of Minnesota) R.R. 2, Houston, Minn.

Bergdolt, Wilmar H. — (Michigan State University) 8801 Truax Rd., Vassar, Mich.

Bies, John L. — (University of Minnesota) 3924 Noble Ave. N., Robbinsdale 22, Minn.

Blood, Ernest R. — (Iowa State University) R.R. 3, Adel, Iowa

Boldt, John H. — (Michigan State University) 1307 I University Village, East Lansing, Mich.

Bonner, James E. — (University of Georgia) R.R. 4, Covington, Ga.

Brodewick, Jerome O. — (Kansas State University) Radium, Kans.

Brown, Galen K. — (Michigan State University) 2108 84th St., Byron Center, Mich.

Bruehl, Daniel L., Jr. — (Oklahoma State University) R.R. 4, Norman, Okla.

Buchheim, Jack — (Kansas State University) Scranton, Kans.

Buchheim, Jerry F. — (Kansas State University) R.R. 1, Scranton, Kans.

Cantwell, James R. — (Texas Technological College) R.R. 1, Bowie, Tex.

Carpenter, Robert D. — (University of Georgia) R.R. 1, Tunnel Hill, Ga.

Carter, Fred D. — (University of Tennessee) R.R. 3, Bulls Gap, Tenn.

Clark, Donald B. — (Clemson Agricultural College) Coker Seed Farm, R.R. 2, Hartsville, S. C.

Colvert, Lundy R. — (University of Arkansas) Box 54, Thornton, Ark.

Corley, Jon — (Montana State University) 1244 Avon, Sheridan, Wyo.

Coulter, Max — (University of Tennessee) R.R. 3, Maryville, Tenn.

Crockett, William E., Jr. — (University of Georgia) R.R. 2, Waynesboro, Ga.

Dano, Policronio L., Jr. — (Auburn University) Apt. 6, e15 E. Thach, Auburn, Ala.

Davis, Larry J. — (Ohio State University) 255 W. Lakeview Ave., Columbus 2, Ohio

Davison, Gary N. — (Texas Technological College) 416 S. 6th St., Donna, Tex.

DeLong, Max M. — Agr. eng. dept., South Dakota State College, Brookings, S. D.

DeShazer, James A. — (University of Maryland) 508 Biggs Ave., Frederick, Md.

Dingle, Stanley O. — (University of Wisconsin) R.R. 3, Richland Center, Wis.

Dodge, William G. — (Louisiana State University) Lee Rd., Covington, La.

Dodson, Giles L. — (A. & M. College of Texas) R.R. 3, Box 313, Corpus Christi, Tex.

Dorgan, Lawrence L. — (Kansas State University) Cullison, Kans.

Draper, Dale L. — (Iowa State University) R.R. 2, Eldora, Iowa

Dyer, David A. — (West Virginia University) Fort Seybert, W. Va.

Flowers, Mike — (University of Arkansas) 903 S. College, Stuttgart, Ark.

Folger, Philip D. — (University of Georgia) Dahlonega, Ga.

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Fraser, William A. — (Montana State College) Box 26, Hall, Mont.

Freer, John J. — (Ohio State University) R.R. 4, Bellefontaine, Ohio

Frickel, Donald — (University of Nebraska) Atkinson, Nebr.

Garrett, Billy J. — (Louisiana State University) R.R. 3, Winnfield, La.

Gay, James E. — (Iowa State University) R.R. 1, Rose Hill, Iowa

George, Raymond S. — (University of Idaho) 1215 Grant St., Boise, Ida.

Gibbens, Thomas A. — Agr. eng. dept., Colorado State University, Fort Collins, Colo.

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Gruber, James L. — (Washington State University) R.R. 3, Box 637, Spokane, Wash.

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Halderson, James L. — (University of Wisconsin) R.R. 2, Galesville, Wis.

Harger, James T. — (Purdue University) R.R. 4, Noblesville, Ind.

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Hereth, Herbert W. — (University of Idaho) 3422 6th St., Lewiston, Ida.

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Holt, Lee A. — (Ohio State University) 2838 Alton Darby Rd., Hilliard, Ohio

Hunter, Richard A. — (Texas Technological College) R.R. 3, Hereford, Tex.

Hunter, Sammie R. — (University of Arkansas) R.R. 1, Huntington, Ark.

Huntley, Charles W. — Agr. eng. dept., Colorado State Univ., Fort Collins, Colo.

Isaacson, Roland H. — (University of Minnesota) Kimball, Minn.

Isom, Arthur E. — (South Dakota State College) U.S. Indian Service, Bur. of Indian Affairs, Aberdeen, S. D.

Jacobson, James H. — (North Dakota State University) Perley, Minn.

Jamison, Warren L. — D-32 N. Court, North Dakota State Univ., Fargo, N. D.

Johnson, Byron A. — (North Dakota State University) McLeod, N. D.

Johnson, Stephan D. — (North Dakota State University) Cavalier, N. D.

Jones, James F. — (University of Georgia) Box 103, Edison, Ga.

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Kester, Philip C. — (University of Nebraska) John Deere Harvester Wks., East Moline, Ill.

Knicely, David R. — (Ohio State University) Adamsville, Ohio

Knudson, Maurice K. — (Montana State College) 927 Poplar St., Missoula, Mont.

(Continued on page 388)

A pick-up type reel is an important contribution to the performance of any harvester — and the design of the right harvester-matched reel is a specialized problem. Why not employ our engineering skill and background to help in this important phase of your overall harvester design? Drawing on our experience of over 25 years and many exclusive patents, we can engineer a pick-up reel tailored to the other design characteristics of your machine, and the crops and areas being served. As a leading producer of pick-up reels, we have the plant capacity and automated production lines to assure you of delivery at reasonable costs. Let us conserve your valuable engineering time.

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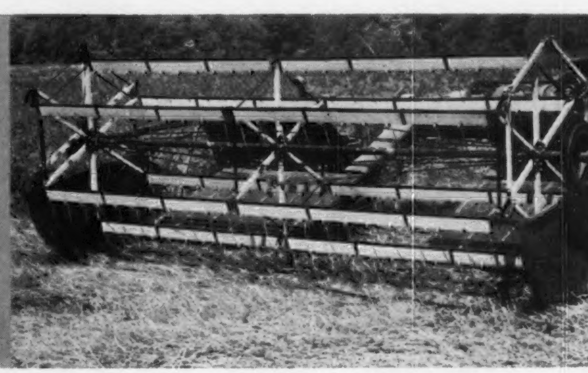

The following bulletins have been released recently. Copies may be obtained by writing to author or institution listed with each.

The three following 1962-63 program announcements for university lecturing-advanced research of the United States Government Grants under the Fulbright and Smith-Mundt Acts are available from the Conference Board of Associated Research Councils, Committee on International Exchange of Persons, 2101 Constitution Ave., Washington 25, D.C.:

(1) *Latin America;* (2) *Australia - New Zealand;* and (3) *South and Southeast Asia.*

The two following publications are available from the Division of Water, 1562 W. First Ave., Columbus 12, Ohio:

Industrial Water Use in Ohio. Ohio Water Plan Inventory Report No. 8. December 1960. Price, 50 cents.

Water Inventory of the Ohio Brush, Eagle, Straight and Whiteoak Creek Basins. Ohio Water Plan Inventory Report No. 15. November 1960. Price, $1.30.

The three bulletins listed below dealing with atomic fallout are available as follows:

Your Basement Fallout Shelter. Blueprint for Survival No. 1. Emergency Measures Organization, Privy Council Office, East Block, Ottawa, Ontario, Canada.

Basement Fallout Shelter, A Guide for Use in the Design of New Homes. Blueprint for Survival No. 2. Central Mortgage and Housing Corp., Ottawa, Ontario, Canada.

Fallout on the Farm. Blueprint for Survival No. 3. Information Division, Canada Department of Agriculture, Ottawa, Ontario, Canada.

The following two bulletins are available from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C. The price of each is 50 cents:

The Golodnaya Steppe and Prospects for Its Reclamation. No. 60-21133.

Ramming Roller for Soil Compaction. No. 60-21158.

The following three Food and Agriculture Organization of the United Nations' booklets are available from Columbia University Press, International Documents Service, 2960 Broadway, New York 27, New York:

FAO Catalogue of Publications — 1945 to 1960.

The Processing of Cocoa, by Terence A. Rohan. Farm Products Processing Informal Working Bulletin 5. 1960.

Soil Erosion by Wind and Measures for Its Control on Agricultural Lands. FAO Agricultural Development Paper No. 71. 1960.

The following 11 test reports are available from the Agricultural Machinery Administration, Province of Saskatchewan, Department of Agriculture, 7th and Hamilton Sts., Regina, Saskatchewan, Canada:

Farm Tractors — 1961. No. 161. April 1961.

Morris 20AD Rod-Weeder (20-ft size). No. 460. February 1961.

Renn Model 59 Rod Weeder Attachment (13-ft size). No. 560. February 1961.

Massey-Ferguson Number 36 Rake (8-ft size). No. 660. February 1961.

Westerasmaskiner Aktiv Model TD Mower (7-ft model). No. 760. March 1961.

McCormick No. 100 Balanced Mower (7-ft model). No. 860. March 1961.

Massey-Ferguson Number 51 Mower (Balanced Head Drive, 7-ft model). No. 960. March 1961.

Massey-Ferguson No. 52 Pull Type Mower (Pitman drive, 7-ft model). No. 1060. March 1961.

Melroe Model 90 Pickup Attachment. No. 1460. April 1961.

Sund Model 80 Pickup Attachment. No. 1560. April 1961.

Innes Model 40 Northwest Special Pick-Up Attachment. No. 1660. April 1961.

Lubricating Oils for Industrial and Heavy-Duty Automotive Engines. January 1961. Internal Combustion Engine Institute, Room 914, 201 N. Wells St., Chicago 6, Ill.

Douglas Fir Plywood Commercial Standard CS45-60, Section One-A Revised. November 1960. Douglas Fir Plywood Association, 1119 A St., Tacoma 2, Wash.

Help Keep Our Land Beautiful. Price, 20 cents each. Quantity prices available from Soil Conservation Society of America, 838 Fifth Ave., Des Moines 14, Iowa.

The following two reports are available from The Israel Institute of Productivity, Citrus House, Tel-Aviv, Israel:

Improvements in Olive Picking Equipment — 1959 Season, by Meir Bensoussan and Ephraim Landgarten.

A Survey of Deciduous Fruit Picking, Sorting and Transport — Summing-Up Report — 1958, conducted by Safrir Nelkin, Ephraim Landgarten, Ben-Ami Silberstein, and Michael Pereen.

The following eight bulletins are available from The British Society for Research in Agricultural Engineering, National Institute of Agricultural Engineering, Wrest Park, Silsoe, Bedfordshire, England:

Steyr Model 182A Diesel Tractor. Report No. 266. November 1960.

Lindeteves 16 in. Drycom Pyrethrum Drier. Report No. 267/EA. October 1960.

David Brown 950 Implematic Livedrive Diesel Tractor Equipped with 11-32 Tires. Report No. 268/O.E.E.C. January 1960.

David Brown 950 Implematic Livedrive Diesel Tractor Equipped with 13-28 Tires. Report No. 269/O.E.E.C. January 1960.

Fahse Monodrill Precision Seeder. Report No. 270. November 1960.

McCormick International B-46 Pick-Up Baler. Report No. 271. November 1960.

Wolseley "Merry Tiller." Report No. 272/EA. January 1961.

Agricultural and Horticultural Engineering Abstracts, Vol. XII, No. 1. Abstracts 1-441. 1961.

Integrating Irrigation with Dryland Farming, by L. W. Schaffner, Laurel D. Loftsgard, and Norman Dahl. Bulletin No. 433. May 1961. North Dakota Agricultural Experiment Station, North Dakota State University, Fargo, N. D.

Tramp Iron Removal from Livestock Feeds, by D. W. Works and J. W. Martin. Bulletin 356. April 1961. Idaho Agricultural Experiment Station, University of Idaho, Moscow, Idaho.

The following two publications are available from Information Division, Canada Department of Agriculture, Ottawa, Ontario, Canada:

Row Spacing Affects Yields of Forage Grasses in the Brown Soil Zone of Saskatchewan, by M. R. Kilcher. Publication 1100. April 1961.

Reseeding Grassland Ranges in the Interior of British Columbia, by Alastair McLean, W. L. Pringle, and T. G. Willis. Publication 1108. April 1961.

. . . Membership Applicants

(Continued from page 384)

Komanek, Francis J. — (Kansas State University) Bavaria, Kans.

Krumboltz, Thomas D. — (Iowa State University) R.R. 4, Fairfield, Iowa

Lambert, Bill G. — (Louisiana State University) Box 41, Kinder, La.

Lee, Russell H. — (University of Georgia) Watkinsville, Ga.

Lohmeyer, Raymond J. — (Kansas State University) South Star Route, Garden City, Kans.

London, Maylon K. — (University of Georgia) R.R. 1, Cornelia, Ga.

Lunte, James W. — (University of Idaho) R.R. 1, Buhl, Ida.

Lyter, Gerald M. — (Pennsylvania State University) R.R. 2, Millerstown, Pa.

Maddox, Thomas E. — (University of Georgia) P.O. Box 236, Chatsworth, Ga.

Mathison, Luther A. — (North Dakota State University) Toronto, S. D.

McCunn, Donald K. — (Iowa State University) R.R. 2, Red Oak, Iowa

McElwee, Lindsay L., Jr. — (Clemson Agricultural College) 106 Pressley St., Clover, S. C.

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McWilliams, Orcenith D.—(Kansas State University) Halstead, Kans.

Meckel, James P. — (University of Idaho) Star Route, Cedar d-Alene, Ida.

Mercer, Albert S. — (University of Georgia) R.R. 1, Dexter, Ga.

Middleswart, LaVerne D. — (Iowa State University) R.R. 2, Indianola, Iowa

Miller, Lynn A. — (Pennsylvania State University) R.R. 2, Towanda, Pa.

Milligan, John E. — (Michigan State University) R.R. 1, Lincoln, Mich.

Mitchell, Bailey W.—(University of Georgia) 5822 Reed Ave., Columbus, Ga.

Molnau, Myron P. — (University of Minnesota) 7421 Lyndale Ave., S., Minneapolis 23, Minn.

Monroe, Gordon E. — (Michigan State University) R.R. 1, c/o Seldon Monroe, Webberville, Mich.

Morrison, John E., Jr.—(Michigan State University) R.R. 4, Ionia, Mich.

Mueller, August C. — (University of Idaho) c/o Harry Martin, R.R. 1, Moscow, Ida.

Naseri, Muthena — Agr. eng. dept., Kansas State University, Manhattan, Kans.

Nygaard, Duane — (University of Wisconsin) Scandinavia, Wis.

Obermeyer, James H. — (Purdue University) R.R. 5, Lafayette, Ind.

Olson, Melvyn — (North Dakota State University) Grand Forks, N. D.

Orr, Paul H. — (North Dakota State University) Ypsilanti, N. D.

Oxford, Milford T. — (University of Arkansas) Pet Milk Co., Chambersburg, Pa.

Parsons, Samuel D. — (Purdue University) R.R. 1, Carbon, Ind.

Peterson, Charles L. — (University of Idaho) R.R. 2, Box 39, Emmett, Ida.

Poland, Harry M. — (West Virginia University) R.R. 3, Box 200, Fairmont, W. Va.

Price, Donald R. — (Purdue University) R.R. 3, Cloverdale, Ind.

Rathje, Allan L. — (Iowa State University) R.R. 2, Clinton, Iowa

Reece, B. Keith — (Iowa State University) New Providence, Iowa

Reeves, George R. — (University of Georgia) R.R. 1, Thomson, Ga.

Rektorik, Robert J. — (Texas A. & M. College) R.R. 1, Robstown, Tex.

Rish, Thomas L. — (University of Georgia) R.R. 1, Box 61, Edison, Ga.

Robbins, Jackie W. D. — (Clemson Agricultural College) R.R. 2, Inman, S. C.

Robe, Glenn — (Kansas State University) c/o C. E. Chambers, Williamsburg, Kans.

Robertson, Woody M. — (Oklahoma State University) (SCS) USDA, Greeley, Calif.

Roelfs, Norman L. — (Kansas State University) Stockton, Kans.

Roseberry, James — (University of Nebraska) With U.S. Navy. (Mail) Dunning, Nebr.

Saxton, Keith E. — (University of Nebraska) 4130 Normal Blvd., Lincoln, Nebr.

Schlader, Dale W. — (University of Idaho) Box 134, Nezparce, Ida.

Schwartz, James D. — (Pennsylvania State University) Valley View, Pa.

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Shea, Paul J. — (North Dakota State University) Minnesota Power & Light, Prairie, Minn.

Shrack, William D. — (Purdue University) R.R. 1, Redkey, Ind.

Smith, Delbert L. — (Texas Technological College) 1308 28th St., Lubbock, Tex.

Smith, Michael R. — (Mississippi State University) Box 85, Canton, Miss.

Sowell, Robert S. — (Mississippi State University) R.R. 3, Coldwater, Miss.

Srivastava, Raj Bahadur Lal — (University of Tennessee) 1221 White Ave., Knoxville, Tenn.

(Continued on page 390)

. . . 54th Annual Meeting

(Continued from page 383)

bound letters — from Egypt, India, and throughout the United States. A special book was placed at the registration desk for friends to write notes to Mrs. J. B. Davidson, who was unable to attend. Carlton Zink circulated a giant greeting card for signatures to be sent to H. F. McColly, who is currently on an assignment in Formosa.

Eugene F. Schneider, vice-president, farm equipment product planning, International Harvester Co., was the principal speaker during the FEI Student Dinner on Tuesday evening

Student Honor Awards

The Student Honor Awards are made to recognize outstanding scholarship attainments and general participation in student activities. Recipients are elected by their respective ASAE Student Branches. The award consists of a certificate and gold key. The following student branch members of ASAE were elected to receive the Award in 1961: Shelton Y. Adcock (North Carolina State College), Howard L. Anderson (Louisiana Polytechnic Institute), David H. Appel (Washington State University), Daniel O. Bridgham (University of Maine), James R. Cantwell (Texas Technological College), Larry W. Cofer (University of Arkansas), Dannie L. Collins (Colorado State University), David Currence (University of Missouri), Gary E. Formanek (Iowa State University), Edward J. Hengen (Washington State University), Robert G. Holmes (Ohio State University), Eldon L. Johns (Oregon State University), Russell Johnson (University of Missouri), Hal Judy (Kansas State University), David Knicely (Ohio State University), Larry J. Kretchmar (Oklahoma State University), Thomas D. Krumboltz (Iowa State University), Lyle S. Martin (University of Illinois), Donald K. McCunn (Iowa State University), James P. Meckel (University of Idaho), Lynn A. Miller (Pennsylvania State University), David V. Nelson (University off Minnesota), Samuel D. Parsons (Purdue University), Wayne L. Peterson (University of Illinois), Leroy K. Pickett (Kansas State University), T. Linton Rish (University of Georgia), Glenn Robe (Kansas State University), Ralph R. Roddy, Jr. (Oklahoma State University), Paul H. Seltzer (Pennsylvania State University), Delbert L. Smith (Texas Technological College), Billy J. Stone (University of Georgia), Rollin D. Strohman (University of Illinois), James G. Storms (University of Idaho), and Theodore M. Zorich (Colorado State University).

PERSONNEL SERVICE BULLETIN

Note: In this bulletin the following listings current and previously reported are not repeated in detail. For further information, see the issue of AGRICULTURAL ENGINEERING indicated. "Agricultural Engineer" as used in these listings is not intended to imply any specific level of proficiency or registration as a professional engineer. Items published herein are summaries of mimeographed listings carried in the Personnel Service, copies of which will be furnished on request. To be listed in this bulletin, request form for Personnel Service listing.

Positions Open — January—O-434-654, 440-655, 461-656, 465-657, 465-658. **February** — O-11-101, 13-102, 10-103, 35-104. **March**—O-67-107, 76-108, 77-109, 71-112, 71-113. **April**—O-95-117, 155-118, 163-119. **May**—O-189-120, 198-121, 199-122, 212-123, 218-124, 226-125. **June**—O-257-126, 257-127, 265-128, 259-129.

Positions Wanted — January — W-444-95, 453-96. **February** — W-8-1, 21-2, 22-3, 29-5, 16-6, 30-7, 34-8. **March**—W-58-11, 56-12, 75-14. **April** W-121-16, 112-17, 135-18, 142-19, 115-20, 160-21, 161-22, 164-24, 166-26, 171-27, 178-28. **May**—W-187-29, 190-30, 97-31, 200-32, 201-33, 202-34, 203-35, 204-36. **June** — W-244-37, 236-38, 264-39, 247-40.

NEW POSITIONS OPEN

Agricultural Engineer for teaching and research in a Northwest Land Grant College. MSAE degree desired. New and growing Agricultural Engineering Department. Teaching: farm power, farm building design and construction, and farm machinery design and theory. Research projects under way: automation in loading and unloading of bunk type silos; improvement of grain combine; also a new project to design and assemble instrumentation to measure transpiration and evaporation in conifers. Retirement benefits; also out of residence leave privileges for advanced study. Salary open. O-284-130.

Agricultural Engineers for product engineer assignments, one on corn machinery and one on grain machinery, with established manufacturer in Midwest. Age 30-45. BSAE or ME, or equivalent practical experience. Experience 8-10 years. Excellent opportunity for advancement. Salary open. O-286-131

Agricultural Engineer for senior engineering position in plant services department of large Midwestern State University. Prefer BSAE with major in farm structures. Experience 5 years. Able to work harmoniously with people, maintain university policy, work independently, and make decisions. Salary $641 per mo. O-293-132

Agricultural Engineer for extension work in a western state. Primary areas of application (1) materials handling, (2) vegetable farm mechanization, and (3) cattle, swine, and dairy farm automation. MSAE or equivalent required. PhD preferred. Extension work experience 4 years. Able to work with people. Salary for MSAE $475-769 per mo.; PhD, present upper limit, $14,000 per year. State medical insurance aid and retirement plan. O-294-133

Agricultural Engineer (research assistant) for half-time work and half-time study for graduate degree. Specialization in power and machinery or processing. BSAE or equivalent, able to meet requirements of graduate school. Salary $2,178 first year; $2238 second year plus state medical insurance plan and tuition. O-294-134

NEW POSITIONS WANTED

Agricultural Engineer for teaching and research in farm structures or electric power and processing with college in Midwest or West. Interested in working on MSAE and teaching during latter part of MS work, with possibility of qualifying for teaching at same school full time on completion of MS. Married. Age 27. No disability. BSAE, 1960, Kansas State University. With SCS since graduation as survey party chief and assistant project engineer on watershed project. Military service 2 yr. in Infantry completed before college training. Available on reasonable notice. Salary open. W-228-41

Agricultural Engineer for development, research, or management in power and machinery or materials handling field with manufacturer, preferably in Midwest. Will travel. Married. Age 33. No disability. BSAE, 1951. Midwest farm background. Apprentice machinist, production work, 3 yr. Research and development 4 yr., primarily on feed handling and other materials handling equipment. Available on reasonable notice. Salary $8000-$10,000. W-213-42

Agricultural Engineer for design, development, or research in power and machinery with industry in Midwest. Married. Age 60. No disability. Design and sales engineering experience in farm equipment field, 30 years. Available on reasonable notice. Salary open. W-285-44

Agricultural Engineer for design, development, or research in power and machinery with college or manufacturer, preferably in Midwest. Married. Age 25. No disability. BS in aeronautical engineering 1957, Purdue University. Experience 4 yr. in design and development of hydraulic pumps. Available Sept. 1. Salary $700 per mo. W-280-45

Farm Power Specialist for sales or service in power and machinery, or electrification with manufacturer, distributor or trade association. Any location. Married. Age 30. No disability. BSA, with major in farm mechanics, 1952, Ohio State University. Farm background. Custom hay baling experience before graduation. With an electric utility since 1952 in field work with farmers and farm electrical equipment dealers to 1957. Since 1957, in development, coordination, and evaluation of farm sales program. Available on 30 days notice. Salary open. W-290-46

Agricultural Mechanization Specialist for sales, service, or management in power and machinery or farm structures with manufacturer, distributor, consultant or federal agency. Southwest or Midwest. Willing to travel. Licensed aircraft pilot. Married. Age 26. No disability. BS in mechanized agriculture, 1957, University of New Hampshire. Dairy farm background. Research associate in agricultural economics 8 months. Active commissioned service in U.S. Army Artillery 3 yr. Available on reasonable notice. Salary $5,500-6,500. W-219-47

Agricultural Engineer for teaching, sales, service or management in power and machinery with college, manufacturer, distributor, or trade association in West. Married. Age 45. No disability. BSA, major in agricultural engineering, 1943, Oregon State University. Experience in college teaching 4 yr.; service manager with major farm equipment distributor 7 yr.; retail farm machinery business 3 yr. War commissioned service in USNR, over 2 yr. Available on 2 weeks notice. Salary $7,000. W-245-48

Agricultural Engineer for design, development, research, sales, service, or writing in power and machinery or rural electrification, with industry or public service. New England area. Willing to travel up to 30% of time. Married. Age 32. No disability. BSA, major in agricultural engineering, 1956, University of Missouri. Farm background. Experience nearly 5 yr. as field test engineer on farm and industrial tractors and equipment with major manufacturer. Military service in Navy 4 yr. as aviation metalsmith. Available on reasonable notice. Salary open. W-287-49

Agricultural Business Graduate for sales or service work in power and machinery or other branch of agricultural engineering, with industry or public service, anywhere in U.S.A. Single. Age 22. No disability. BS in Agricultural business, 1961, Michigan State University. Farm background. Available on reasonable notice. Salary open. W-296-50

. . . Membership Applicants

(Continued from page 388)

Srivastava, Keshava Prasad — (University of Tennessee) 1525 Laurel Ave., Knoxville, Tenn.

Stark, Gary K. — (North Dakota State University) Columbus, N. D.

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Stone, Billy J. — (University of Georgia) R.R. 2, Warrenton, Ga.

Storms, James G. — (University of Idaho) Box 295, Plummer, Ida.

Stuber, Paul R. — (Ohio State University) R.R. 4, Leipsic, Ohio

Talley, Henry H. — (Louisiana Polytechnic Institute) R.R. 2, Ruston, La.

Tanner, Eugene H. — (Michigan State University) 3152 W. Stanley Rd., Mt. Morris, Mich.

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Thomas, Lloyd E. — (Pennsylvania State University) R.R. 2, Edensburg, Pa.

Thompson, Charles S. — (University of Wisconsin) R.R. 2, Westby, Wis.

Thorson, George A. — (University of Idaho) R.R. 1, Graceville, Minn.

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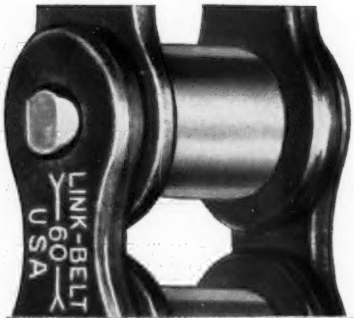

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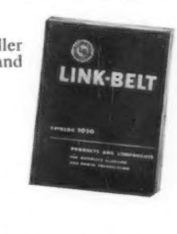

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